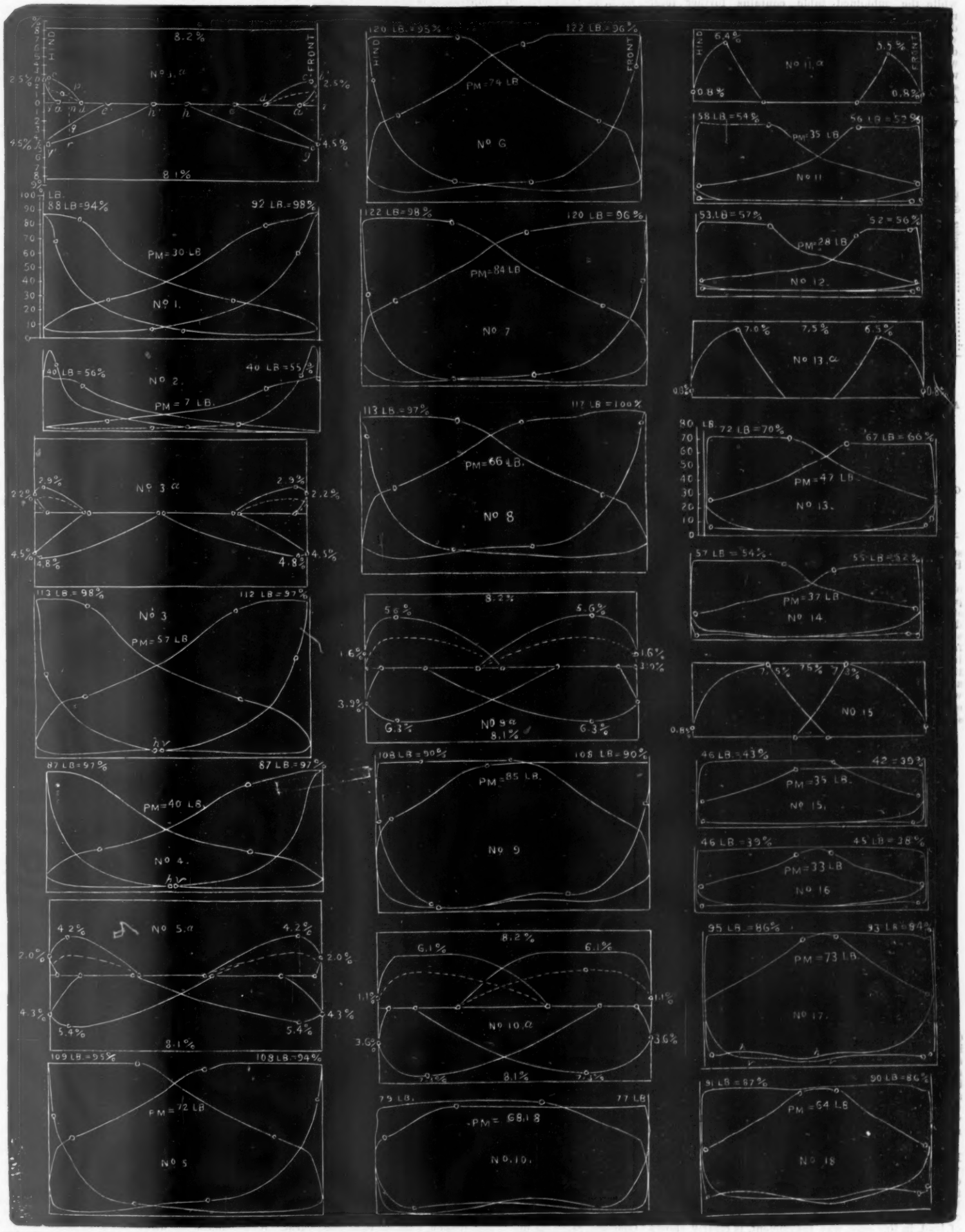
RAILROAD GAZETTE

SATURDAY, AUGUST 26, 1871.




## BAUSCHINGER'S INDICATOR EXPERIMENTS ON LOCOMOTIVES.

(Continued from page 238.)

We will now proceed to explain the construction of the diagram showing the action of the valve gear which is annexed to each set of indicator cards, and which is called by Professor Bauschinger the distribution diagram.

As an example, we will select the distribution diagram referring to the first "notch" of the mixed engine, *A*, illustrated at the head of the series of diagrams belonging to that engine. These, and all the other diagrams we illustrate, are, as we may mention, drawn to one-half their original size. The points at which the supply of steam is cut off, in this case, are at 14 per cent. and 19 per cent. of the stroke (hind and front end respectively), as ascertained from the valve-motion diagram. The line, *o z*, represents the stroke, and parallel to this line are drawn, also half size, the steam ports for the admission and release, the former above and the latter below, *o z*. We will now assume the piston to move on its stroke from the front to the hind end, or from *z* to *o*. Having arrived at a point, *a*, near the hind cylinder end, the valve opens the port to admit the steam, which, at the end of the stroke, is admitted to the amount, *o*, *b*, called "hind pre-admission." The piston begins now its return stroke, at the commencement of which the opening of the port still increases a little, till the maximum opening is reached at *c*, corresponding to the position of the piston at *y*. From this point the valve begins to close the port again, and when the piston is at a point, *d*, the supply is cut off and expansion takes place, till a point, *e*, is reached, marking the opening of the valve to the exhaust, which, at the end of the stroke, is open to the amount, *z*, *f*, termed by the professor the "pre-release." As the piston moves again from *z* towards *o*, the exhaust opening still increases till *g*, and becomes shut

when the piston has arrived at A. From this point the piston compresses before it the steam remaining in the cylinder till it has arrived at *a*, when the valve opens the port again for the pre-admission, and when the same process begins again. In a similar manner the other distribution diagrams contained in our illustrations explain the action of the slide-valves for the various degrees of expansion, while the subjoined table contains further information which could not be conveniently given on the diagrams themselves. Before proceeding further, we wish to call attention to the dotted lines shown in the diagram just described These lines refer to curves which would have been obtained with an ordinary slide-valve, and show already clearly the advantages presented by the auxiliary steam passage of the Trick or Allen valve.

We will now examine the form of the indicator valves with reference to the principal periods of the steam distribution, here again following the course of Professor Bauschinger's observations:

(*a*) Lead or pre-admission. To insure a good action of the steam it is essential that the maximium cylinder pressure be attained at the very commencement of the stroke. If this is the case, the adhesion line of the indicator diagram—the piston being at the end of the stroke—will rise in a vertical line, neither receding from it nor, after the vertical has been reached, recoiling from it again. The former defect is particularly the case with the shifting-link motion when working at a high degree of expansion, as shown in diagram No. 1, while in diagrams Nos. 9 and 10, taken at the sixth and eighth notch respectively, the admission line recoils slightly from the vertical. Under the circumstances of

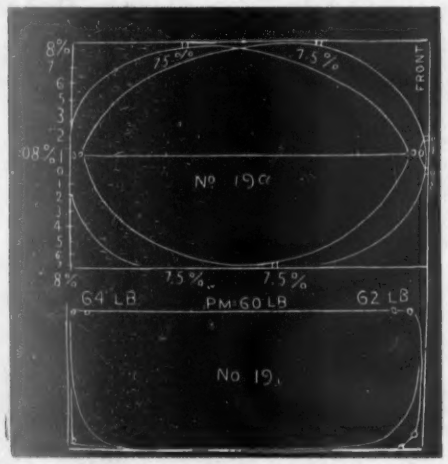



diagram No. 1 the area of the opening for pre-admission is 2.5 per cent. of the piston area (as shown by the scale) and for the moderate speed at which the engine was running, this amount of lead is, no doubt, too much; in diagrams Nos. 9 and 10, on the other hand, a pre-admission of from 1.1 to 1.6 per cent. of the piston area would appear much too small, even in the latter case where the engine was making but 54 revolutions per minute.

In this respect the curves obtained with the Meyer valve gear show a marked distinction, which will already be apparent by a mere in-pection of the distribution diagrams. The series of curves taken from the goods engine, *g*, show that, in the case of Meyer's motion the amount of pre-admission remains constant for all degrees of expansion. That the amount of lead, in this case, was insufficient, is clearly shown in the diagrams by the admission lines withdrawing from the vertical lines which mark the end of the stroke. Constant lead involves also constant compression, and this latter seems to have been avoided as much as possible in the engines, E, F, and G, with the Meyer gear, as shown by the diagrams and also in Table II. The deficiency of lead in this case appears, therefore, all the more faulty, as both elements, lead and compression, will be seen that the pre-admission begins when the piston has yet 4 per cent. of the length of stroke to travel, while the amount of lead is 2.2 per cent. of the piston area. When the Meyer valve-motion is employed, Professor Bauschinger recommends an amount of lead of 2 per cent. of the piston area, and also that the lead should begin at 3 per cent. of the stroke before the dead point is reached, and that the compression should amount to at least 10 per cent. of the length of of the stroke. These data depend, of course, on the amount of stroke and angular advance of the eccentric, on the lap of the valve, etc.

In our next number we shall examine the indicator curves with regard to the element of admission.—*Engineering.*

(TO BE CONTINUED.)

TABLE NO. IV.: REFERENCE TO DIAGRAMS ON THE PRESENT AND PRECEDING PAGES.

| Class of engine. | System of valve motion. | DISTRIBUTION DIAGRAMS. Reference number. | Degree of expansion or notch. | Period of admission in per cent. of stroke. Hind end of cylinder. | Front end of cylinder. | INDICATOR DIAGRAMS. Reference number. | Number of revolutions of driving wheel per minute. | Mean speed of piston, in feet, per second. | Amount of regulator opening. | Amount of opening of blast-pipe orifice. | Mean boiler pressure, in pounds, per square inch. | Maximum cylinder pressure. Hind end. In pounds per square inch. | Hind end. In per cent. of boiler pressure. | Front end. In pounds per square inch. | Front end. In per cent. of boiler pressure. | Mean cylinder pressure (P. M.) in pounds per square inch. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1a | 1st | 14 | 19 | 1 | 119 | 7.9 | ⅛ open | ¼ shut | 91 | 88 | 94 | 93 | 98 | 30 |
| | | | | | | 2 | 144 | 9.6 | ¾ open | open | 71 | 40 | 56 | 41 | 58 | 7 |
| | | 3a | 2nd | 19 | 27 | 3 | 85 | 5.7 | ½ open | open | 116 | 113 | 98 | 113 | 97 | 57 |
| | | | | | | 4 | 124 | 8.3 | ½ open | open | 90 | 87 | 97 | 87 | 97 | 41 |
| A Stephenson | | | | | | 5 | 84 | 5.6 | ½ open | ¼ shut | 115 | 109 | 95 | 108 | 94 | 72 |
| | | 5a | 4th | 33 | 43 | 6 | 79 | 5.3 | ½ open | ½ shut | 126 | 120 | 95 | 122 | 96 | 74 |
| | | | | | | 7 | 94 | 6.3 | ½ open | open | 125 | 122 | 98 | 120 | 96 | 61 |
| | | | | | | 8 | 94 | 6.3 | ½ open | shut | 117 | 113 | 97 | 117 | 100 | 66 |
| | | 9a | 6th | 49 | 60 | 9 | 75 | 5.0 | ½ open | open | 120 | 106 | 90 | 106 | 90 | 65 |
| | | 10a | 8th | 63 | 71 | 10 | 54 | 3.6 | starting | open | 95 | 79 | 83 | 77 | 81 | 68 |
| | | | | | | 11 | 108 | 7.2 | ¾ open | open | 108 | 58 | 54 | 56 | 52 | 35 |
| | | 11a | 0 | 31 | 28 | 12 | 160 | 10.7 | ¾ open | open | 99 | 53 | 57 | 53 | 56 | 28 |
| | | | | | | 13 | 107 | 7 1 | ¾ open | open | 102 | 79 | 70 | 67 | 66 | 47 |
| | | 13a | 5-6 | 40 | 39 | 14 | 134 | 8.9 | ¾ open | open | 106 | 57 | 54 | 55 | 53 | 37 |
| G Meyer | | | | | | 15 | 83 | 5 5 | ¾ open | open | 107 | 46 | 43 | 49 | 39 | 25 |
| | | 15a | 4-6 | 58 | 57 | 16 | 198 | 8 5 | ¾ open | open | 117 | 46 | 39 | 45 | 34 | 33 |
| | | | | | | 17 | 92 | 6.1 | open | open | 110 | 95 | 86 | 93 | 84 | 73 |
| | | | | | | 18 | 96 | 6.4 | open | ½ hut | 105 | 91 | 87 | 90 | 86 | 64 |
| | | 19a | 1-6 | 96 | 97 | 19 | .. | .... | starting | open | 118 | 64 | 56 | 62 | 54 | 60 |

## CHICAGO & NORTHWESTERN RAILWAY.

*General Superintendent's Report.*

We give below the report of the General Superintendent of the Chicago & Northwestern Railway, John C. Gault, for the year ending May 31, 1871. We have added in the tables the mileage of each division and its earnings last year:

A review of the statistics of the operations of the company's lines for the past year shows a decrease in the gross earnings of $840,513.77, as compared with the previous year—more than one-half of which decrease is in the passenger business alone. It will observed that of this large falling off in the passenger traffic, nearly $300,000 is on through travel between Chicago and Omaha, which decline may be accounted for partly by reason of the opening of other through lines, but principally on account of a general decline in travel between Chicago and the Far West. The remainder of the falling off in passenger earnings is general at all seasons, and is to be attributed more to the depression of business throughout the West than to any particular diversion of travel to other lines.

The freight business of the road shows a decrease in gross earnings, while the tonnage moved shows a small increase. This increase is mainly upon the Peninsula Division. It is but fair to state, however, that during the year considerable quantities of building material were freighted for new roads, belonging to other companies, then in course of construction, at prices below the average of our general freight rates; which, while it swelled our tonnage largely, did not compensate for the falling off in the grain and other more profitable traffic.

The traffic of the Iowa Division has suffered a greater decline than any other part of the company's lines. This result is to be accounted for partly by reason of the great falling off in the through business, which has heretofore been an important item in the earnings of that division, and partly in consequence of unsatisfactory grain crops along the whole line, seriously diminishing the volume of its local freight traffic. With the establishment of a more energetic policy, recently inaugurated, respecting the sale and settlement of lands owned by the Cedar Rapids & Missouri River Railroad Company, along the line of that division, I am led to believe it may be relied upon for a steady increase in its future earnings.

New lines of road constructed during the past year in the State of Iowa, as well as in Illinois, in the interest of rival routes, have diverted a small amount of traffic which was formerly enjoyed by this company, and in some instances have had the effect to reduce our established prices; but I am glad to say no severe competition has as yet resulted therefrom.

The decrease in earnings on the Galena and the Wisconsin divisions has been chiefly owing to the unsatisfactory harvest of 1870, and is not in any great measure attributable to a diversion of our former business to other routes or to other markets.

It is gratifying to be able to state that the business of the Milwaukee Division, as well as that of the Peninsula Division, continues to show a satisfactory increase, and I have no doubt this portion of the company's lines may be relied upon for a steady improvement from year to year.

The business and expenses of the several divisions of the road were as follows:

The earnings were:

WISCONSIN DIVISION (314.6 MILES).

| | |
|---|---|
| Passenger | $ 804,925 06 |
| Freight | 1,685 607 13 |
| Express | 51,984 13 |
| Mail | 46,648 54 |
| Miscellaneous | 79,513 76 |
| Total ($8,619 per mile) | $2,611,578 67 |
| Total previous year | 2,746,585 30 |
| Decrease | $135,006 63 |

GALENA DIVISION (293.4 MILES).

| | |
|---|---|
| Passenger | $ 967,781 88 |
| Freight | 2,774,656 21 |
| Express | 83,882 15 |
| Mail | 46,164 57 |
| Miscellaneous | 116,978 10 |
| Total ($13,596 per mile) | $3,989,262 91 |
| Total previous year | 4,238,403 08 |
| Decrease | $249,140 17 |

IOWA DIVISION (389.4 MILES).

| | |
|---|---|
| Passenger | $ 809,844 71 |
| Freight | 1,939, 85 46 |
| Express | 55.703 38 |
| Mail | 70,610 00 |
| Miscellaneous | 3,712 84 |
| Total ($7,395 per mile) | $2,879,556 39 |
| Total previous year | 3,419,086 90 |
| Decrease | $539,530 51 |

MADISON DIVISION (67.6 MILES).

| | |
|---|---|
| Passenger | $ 66,324 39 |
| Freight | 133.240 43 |
| Express | 3,945 33 |
| Mail | 6, 59 34 |
| Miscellaneous | 3,106 52 |
| Total ($2,999 per mile) | $20+,705 91 |
| Total previous year | 217,714 93 |
| Decrease | $15,009 02 |

PENINSULA DIVISION (73.8 MILES).

| | |
|---|---|
| Passenger | $ 23,436 30 |
| Freight | 845,182 21 |
| Express | 1.565 00 |
| Mail | 4,650 00 |
| Miscellaneous | 10,789 57 |
| Total ($11,728 per mile) | $ 865,573 ·8 |
| Total previous year | 733,3:6 07 |
| Increase | $142,267 01 |

MILWAUKEE DIVISION (85 MILES).

| | |
|---|---|
| Passenger | $ 660,896 79 |
| Freight | 402,487 30 |
| Express | 41,732 29 |
| Mail | 14,622 91 |
| Miscellaneous | 26,496 19 |
| Total ($13,485.14 per mile) | $1,146,237 48 |
| Total previous year | 1,090,33· 93 |
| Increase | $55,9 5 55 |

OPERATING EXPENSES OF THE DIFFERENT DIVISIONS.

| DIVISIONS. | 1870 and 1871. | 1870 and 1871. | Per centage of earnings that the operating expenses were, for 1870 & '71. | Per centage of earnings that the operating expenses were, for 1869 & '70. |
|---|---|---|---|---|
| Wisconsin | $2,170,671 59 | $1, 87,543 01 | 79.74 | 60.79 |
| Galena | 2,261 532 02 | 1,854,602 56 | 58.36 | 46.49 |
| Iowa | 2,536.650 24 | 1,820, 63 40 | 74.19 | 63.21 |
| Madison | 157,488 84 | 145,687 64 | 79.37 | 71.87 |
| Peninsula | 414,754 67 | 367,630 8 | 57.34 | 42.65 |
| Milwaukee | 572,159 96 | 535,778 89 | 52.47 | 46.74 |
| Total | $8,013,317 34 | $6,311,506 50 | 63.93 | 53.96 |

The decrease in operating expenses for the past year has been $1,659,791.85, and in taxes, $42,019.19, making a total reduction of $1,701,811 04, as compared with the previous year; nearly $700,000 of which reduction has been made in wages alone, and over $400 000 in the cost of fuel used. These sums, added to the abatement in prices of other supplies, as compared with former prices paid, have rendered the reduction in operating expenses easily attainable, without suffering the road-bed, track or rolling stock of the company to deteriorate, in order to accomplish that result. The track on all the various lines is in better condition than at the commencement of the year, and the condition of the rolling stock has been fully kept up and maintained.

It is gratifying to be able to state that no passenger has been killed or seriously injured, during the year, on any of the company's lines.

## Manslaughter by Corporations.

Under this head the New York *Evening Post* comments on the verdict of the coroner's jury over the bodies of those killed by the explosion of the ferry-boat Westfield, which was as follows:

"We find that the deceased, Andrew Coyle and others, died through a rupture or explosion of the boiler of the ferry-boat Westfield, July 30, 1871; that said explosion or rupture was caused by a flaw in the iron and by the negligence of the engineer Robinson in carrying an over-pressure of steam; that the company are responsible for the disaster, as the defect could have been detected if the Staten Island Ferry Company had had a competent superintendent, engineers and mechanics in their employ, and are, therefore, criminally negligent. We recommend the district attorney to take prompt action in the matter. We also think that the government inspection is very imperfect as now conducted."

Public opinion here fully sustains the verdict in its principal conclusions. The evidence compelled it. An engineer who exceeds the pressure of steam allowed by his certificate is negligent. A superintendent who employs an ignorant and incompetent engineer is negligent. A president or director who permits an imper-

fect boiler to be used, or a careless engineer to hold his office is negligent, and any negligence by which the lives of the public are endangered is necessarily criminal. The trust held by a transportation company is one which binds it and all its servants to the highest possible vigilance, even to what the law calls extraordinary diligence, in preventing danger. Whenever they come short of this highest degree of diligence, and the result is the death of a person entrusted to them, they are guilty of manslaughter.

The law of this subject is already clear enough. The difficulty lies in executing it. The officers inculpated in such crimes are generally men of character and prominence; men with hosts of friends; men who have estimable qualities, and who are so far removed from "the criminal classes" that society is unwilling to treat them as criminals. The community has, as yet, no properly educated conscience on this subject. Its conscience is far behind the law. When the public learn to regard negligence in these high trusts as a crime, not less reprehensible, morally, than the killing of a man in the heat of passion in a private broil, it will only have come up to the just standard of the law, and will only then be ready to enforce the law as it is.

Few communities are in advance of New York in this respect, and many are far behind it. A coroner's jury yesterday sat in Bangor, upon the bodies of citizens killed by the falling in of a decayed bridge in that city, under a train of the Maine Central Railway. The jury consisted of prominent business men of that city, and may be supposed fairly to represent the public opinion of the community. The evidence clearly proved that the bridge was examined on June 8, by the railroad commissioners of the State, with the bridge superintendent of the company, and found unsafe. Yet it was not until July 17 that these officers gave notice of its bad condition to the Assistant Superintendent of the railway; and it was not until July 24th that he officially notified the General Superintendent of the fact. Sixteen days more passed, during which it is to be supposed that the Superintendent was making up his mind to renew the bridge, and then it broke down, and the manslaughter was complete.

In spite of these facts, the coroner's jury ascribes the "accident" to the existence of the State Board of Railroad Commissioners; and thinks that "life and limb would have been safe" but for them, "because without them no division of responsibility could possibly be alleged." It seems to us that it was the obvious duty of these commissioners to see that the bridge was made safe before another train was permitted to pass it; that their neglect of this duty makes them guilty of manslaughter; and that the three negligent and procrastinating superintendents are all personally guilty of the same crime. There may often be, there often is, a division of responsibility which perplexes investigation, but the difficulty does not arise in a case like this, where the guilt is simply extended to many. If ten or a hundred men conspire to commit a crime, each is, both legally and morally, as guilty as if he did the deed alone.

The public need an education on this subject which they will rapidly get, if the principles which we have indicated are kept in view by the independent press, and constantly applied to all such cases as they occur. We trust that an example will be made in the Westfield case which will show all conductors, engineers, brakemen, superintendents, directors, and presidents who administer our public highways, that the community and the law require of them the utmost prudence they are capable of in preventing danger, and that any negligence whatever, in a trust like this, imperils their own reputation, future social position and even personal freedom, just as far as it imperils the lives which are under their protection.

## Steam Engine Governors.

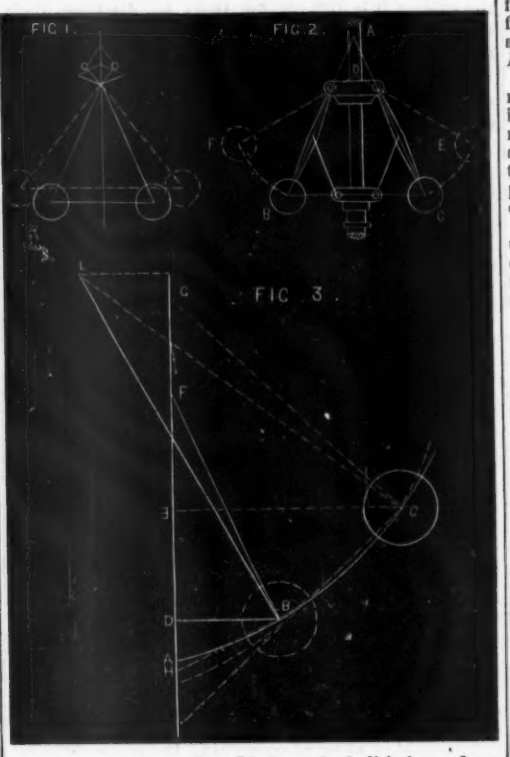
The following is an abstract of a paper read before the Institute of Mechanical Engineers, as reported in *The Engineer*:

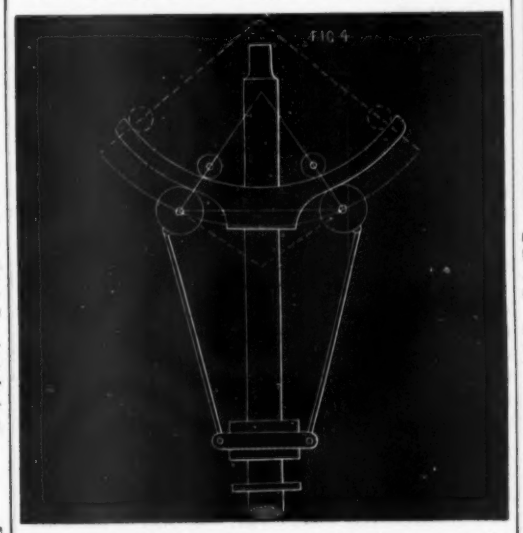
The object of this paper was to show that, while the Watt governor, as at present in use, allows a serious change of speed before it effects the required regulation in the supply of steam to the engine, yet it may, without any material increase of complexity or expense, be so modified in construction as to approach very nearly to the standard of theoretical perfection.

The author examined the mode of action of the conical governor and compared it with that of the parabolic governor. He then went on to say that in the form of governor made by Watt the actual extent of variation of speed was reduced to a very small amount. Fig. 1 is a diagram of the original governor preserved at South Kensington. By choosing a height of cone which corresponded with a slow speed, and making the angle of the arms with the axis small at their lower position, and limiting the change of angle to a minimum, and by the method of actuating the sliding-piece at the top, he secured a sufficient rise and fall of the latter with an extremely small change of height in the described cone.

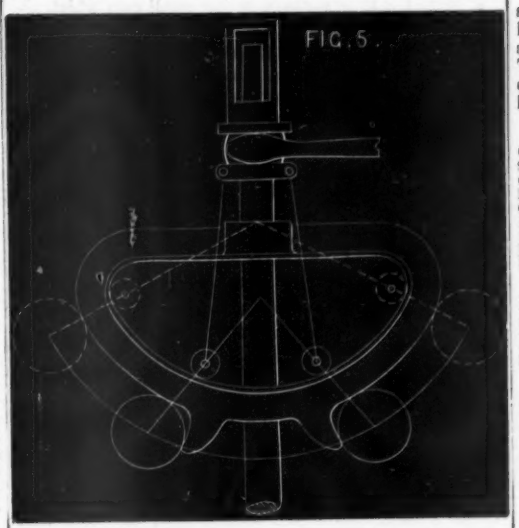
Fig. 4 represents the first parabolic governor introduced into this country at the exhibition of 1851 by an exhibitor from Vienna. The balls were suspended by links from rollers, and the arms were bent so as to cause the centers of the balls to describe a parabola. The writer had applied a governor of this kind to some engines at Darlington a few years afterward, and he found it necessary to control the perpetually running up and down by attaching to the sliding-piece an air-cylinder, as shown in fig. 5.

The governor then became perfectly successful. There are, however, some disadvantages connected with the parabolic governor: it is somewhat complicated and costly, and the surfaces of the rollers and the paths on which they travel are liable to wear into inequalities of level. These considerations suggested the idea of constructing a simpler governor by sacrificing a small portion of the perfections obtained by adhering rigidly to the true parabola. Referring to the dotted line in fig. 3, although no arc of a circle can exactly coincide with a portion of a parabola, yet it may approximate very nearly. If, then, the ball is hung from *L*, the center from which a circular arc is described, a governor will be obtained which is nearly parabolic, and with all the simplicity of the ordinary governor. It will be seen that the centers of suspension are situated each on the side of the vertical spindle opposite to the suspended ball, the arms being crossed.



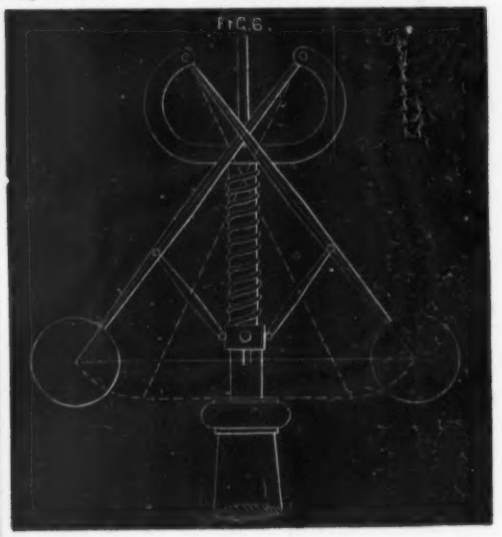

The mode of laying down this approximate parabolic governor is as follows: The lowest position of the ball, *B*, is first fixed according to convenience, and the height of the cone, *D F*, is determined according to the number of revolutions intended. The line, *B H*, is then drawn at right angles to *B F*, and the bisection of *D H* at *A* gives the apex of the parabolic curve. The total rise, *D E*, of the ball is then fixed at the amount considered desirable, and the proportion of *E C* to *D B* is made the same as that of $\sqrt{E\ A}$ to $\sqrt{D\ A}$. A point, *C*, is thus found in the parabolic curve as the ordinate, *E C*, of a parabola, and is proportionate to the square root of the corresponding abscissa, *E A*; and in a similar way any number of intermediate points may be found. It only remains to find by trial a center, *L*, from which an arc may be drawn coinciding as nearly as possible with that portion of the parabola between *B* and *C*.




In order to ascertain the number of revolutions corresponding to any height of cone from 6 inches to 36 inches, calculations are made from the data that the number of revolutions is inversely proportionate to the square root of the height of the cone, and that when the latter is 39.1393 inches, or the length of a second's pendulum, the time of revolution being equal to a double oscillation thereof, or two seconds.

Fig. 6 represents a governor on the plan at present in use at the Newport Rolling Mills. Here the air-cylinder is done away with, and a spiral spring placed upon the spindle. There are ten of these governors at work at the Newport Mills.

The error in the action of the ordinary governor becomes increased where the arms are hung from two separate points of suspension, away from the spindle and each on the same side as the suspended ball, as shown in fig. 2. Then the fault of variability in the height of the cone becomes aggravated, the apex being actually lowered instead of remaining stationary as the balls rise. The variation of speed with such a governor is proportionately increased, and in extreme cases hardly any benefit can be derived. In the governor shown in fig. 2 the balls would begin to rise at 28½ revolutions, and would require 46 to reach the position shown in the dotted lines. The cone *A B C* curtailed at both ends becomes at last represented by *D E F*. The extreme variation of the engines would amount to 47 per cent. of its mean speed.




Mr. Olrick spoke in praise of Mr. Siemens' governor, and in consequence Mr. Siemens thought it unnecessary further to allude to it, but he was inclined to look with favor on the form of governor shown in fig. 2, and he pointed out that the addition of the spiral spring to the approximate parabolic governor was a great advantage. The only kind of governor that would act on the valve directly when a change occurred was the differential governor; short of this, the parabolic governor was satisfactory.

Mr. Head explained that the spring was not in action when the balls began to rise. The balls started freely; then the spring, which was a very light one, retarded them slightly.

## MISCELLANEOUS.

—The New York Central & Hudson River, the Pennsylvania Central and the Erie companies have made an important reduction of their transportation rates for all classes of Western freights from New York westward The following is a list of the old and new traiffs, in cents per hundred weight, for first-class freights, which includes dry goods, teas and coffees and boots and shoes:

| New York to | New rate. | Old rate | New York to | New rate. | Old rate. |
|---|---|---|---|---|---|
| Cleveland, O..... | $0 29 | $0 49 | St. Louis, Mo..... | $0 60 | $0 97 |
| Sandusky, O..... | 33 | 54 | Cairo..... | 57 | 96 |
| Columbus, O..... | 35 | 60 | Toledo, O..... | 34 | 58 |
| Dayton, O..... | 39 | 66 | Fort Wayne..... | 40 | 65 |
| Cincinnati, O..... | 40 | 69 | Kansas City, Kan. | 1 15 | 1 52 |
| Indianapolis, Ind.. | 42 | 71 | Leavenworth, Kan. | 1 18 | 1 55 |
| Terre Haute, Ind.. | 45 | 75 | Chicago, Ill..... | 45 | 75 |
| Evansville, Ind.... | 50 | 85 | Milwaukee..... | 45 | 75 |
| Louisville, Ky..... | 54 | 86 | Detroit..... | 31 | .. |

The Lake Erie steam rates to Cleveland, Toledo and Detroit have been reduced from forty-four to twenty-six cents. The steam rates around the lakes to Chicago, Racine, Milwaukee and Green Bay, have been reduced from fifty-two to thirty-one cents.

—The first railroad passenger car in the history of the Island of Cape Breton passed over the line of the "International Coal & Railway Company" recently. The shipping at the pier in Sydney, in honor of the event, displayed a full adornment of bright bunting, making a fine effect.

—The Capital Horse Railroad, of Springfield, Ill., was sold on the 22d inst. at auction, to J. Taylor Smith, for $8,000, and rumor says the track is to be taken up.

—The London *Railway News* speaks of a branch of the Brighton Railway, a little more than a mile long, recently completed at a cost of a little more than £10,000 as "the cheapest bit of railway ever constructed within a hundred miles of London."

RAILROAD GAZETTE

PUBLISHED EVERY SATURDAY.

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## Editorial Announcements.

*Correspondence.—We cordially invite the co-operation of the Railroad Public in affording us the material for a thorough and worthy Railroad paper. Railroad news, annual reports, notices of appointments, resignations, etc., and information concerning improvements will be gratefully received. We make it our business to inform the public concerning the progress of new lines, and are always glad to receive news of them.*

*Inventions.—Those who wish to make their inventions known to railroad men can have them fully described in the* RAILROAD GAZETTE, *if not previously published,* FREE OF CHARGE. *They are invited to send us drawings or models and specifications. When engravings are necessary, the inventor is expected to furnish his own engravings, or to pay for them.*

*Articles.—We desire articles relating to railroads, and, if acceptable, will pay liberally for them. Articles concerning railroad management, engineering, rolling stock and machinery, by men practically acquainted with these subjects, are especially desired.*

*Engineering and Mechanics.—Mr. M N. Forney, Mechanical Engineer, whose office is at Room 7, No. 72 Broadway, New York, has been engaged as Associate Editor of this journal in charge of these departments. He is also authorized to act as our agent.*

☞ *Our Prospectus and Business Notices will be found on the last page.*

## THE RELATIVE COST OF 3-FEET AND 4-FEET 8½-INCH-GAUGE RAILROADS.

On another page, over the signature "L. M." will be found some estimates of the relative cost of roads of the above gauges. These estimates are not less accurate than many others which are now so current in the daily papers and elsewhere, and may, therefore, be taken as a fair example of the statements of the advantages of the narrow gauge. They are made upon the same basis as all the others which we have thus far seen. That is, they compare the cost of a narrow-gauge road and a very light equipment, with one of 4-feet 8½-inch gauge having heavy rolling stock, which is like comparing the cost of a stone house with small rooms and low ceilings, with that of one built of brick with large room and high ceilings, and reasoning therefrom that because the latter cost the most, therefore stone is the cheaper building material. It is true that with the same number of rooms as many people might live in the small house as in the larger one, just as the same traffic might be done on the narrow as on the wide gauge, but neither the people who live in small houses nor the traffic on the railroads would be accommodated so well in a contracted space as they would be with more room.

We, therefore, propose to compare the cost of a wide-gauge road which will give *the same conveniences and facilities for traffic* that the narrow one would, and thus show what the difference due to gauge would be.

In a letter published in the GAZETTE of July 8, the capacity of freight-cars for the 3-feet gauge is given as 2½ times their weight. In an editorial in the same paper we showed that the weight of a loaded four-wheeled box car for a 4-feet 8½-inch gauge would not be 1 per cent. greater than for a 3-feet gauge. The advocates of a narrow gauge invariably take the lightest kind of car which can be built and compare it with the heaviest kind of car now running on wide-gauge roads. We fully believe that our 4-feet 8½-inch-gauge roads do carry too much dead weight, but it does not therefore follow that the only way to reduce it is to narrow the gauge.

We believe, too, that cars can be built for a 3-feet gauge which will carry 2½ times their own weight of freight, but it is also true that the weight of the same kind of car to carry the same relative amount of freight, at the same speed, and have the same strength in a 4-feet 8½-inch-gauge road will not be over *one per cent. more than the other when they are both loaded.* That the proportion of dead to paying weight is reduced if the gauge is narrowed, has been so often re-iterated and the impression has now become so general among unprofessional readers, that we find, in any discussion of the subject, it is difficult for them to disabuse their minds of the error. To show that we are not alone in the denial of it, we quote from an editorial article in *Engineering*, in which the same views which we have expressed are stated very clearly and forcibly. The writer says:

"Another fallacy upheld by the advocates of very narrow-gauge lines is, that the narrower the gauge the less—almost in an equal degree—is the proportion of dead weight to paying load whereas both theory and experience go to prove that so long as the amount of accommodation, and the strength to resist hauling and buffing strains are constant, the proportion of dead weight to paying load is almost, if not entirely, independent of the gauge. In other words, if the maximum weight of train in which a vehicle is to be used, and the maximum power of engine to the pulling and pushing of which it is to be subjected be fixed, it matters little so far as the proportion of dead weight per ton of goods, or per passenger carried, is concerned, whether the gauge of the line on which the vehicle is to run be 2 feet 9 inches or 5 feet 6 inches. This, we know, is a statement which many advocates of very narrow-gauge lines will be disposed to contradict flatly yet it is a statement which is supported by ample practical evidence. We have before us particulars of the weights and carrying capacities of the Norwegian, Queensland, and other narrow-gauge rolling stock, both for passenger and goods traffic, and with scarcely an exception these particulars prove the correctness of the opinion we have just expressed. Even in the case of the extremely narrow Festiniog Railway we find the dead weight of the passenger stock to be greater per passenger carried than many carriages running on the Continent on 4-feet 8½-inch-gauge lines, these latter carriages, notwithstanding, affording a greater number of cubic feet of capacity for passenger, and being mounted on 40-inch in place of 18-inch wheels. Similar evidence might be adduced concerning the goods-carrying stock were it necessary to do so; but we need merely refer to the carriages and wagons in general use on ordinary lines fifteen or eighteen years ago to prove that light stock can be made for the 4-feet 8½-inch, or a wider gauge, if the general nature of the traffic warrants its use."

Perhaps the diversity of the statements which are made with reference to this point by the narrow-gauge advocates may show the exceedingly inaccurate character of some of them. For example, Mr. Fairlie says that a four-wheeled box car will carry three times its own weight of freight; Mr. Schuyler, Secretary of the Denver & Rio Grande Railroad Company, says 2½ times; the report of the Massachusetts committee, twice its own weight; and the circular issued by M. Baird & Co., 1¾ times. Be their carrying capacity, however, what it may, there is this undoubted fact, that the weight of any of the narrow-gauge cars would be increased very little if they were made for a 4-feet 8½-inch instead of a 3-feet gauge, and so far as the effect upon the track is concerned, this slight difference would be much more than compensated for by the greater stability due to the wider wheel base.

The question is not the relative cost of a narrow-gauge road with light equipment, and one of 4-feet 8½-inch gauge with a heavy track and rolling stock, but it is this: given a section of country in which there will be a comparatively small traffic, what will be the difference in the cost of building a road of 3-feet gauge to do this business, and one of a 4-feet 8-inch gauge which will afford equal facilities and conveniences and do it in every respect equally well?

If there is any advantage in the small cars which are proposed for narrow-gauge roads, they can be made equally small for the wide gauge, and as practically they will be no heavier, the rails and fastenings may be of the same weight in each case. Excepting the length, the cross ties may be the same size. All estimates therefore which calculate the cost of heavy rails and fastenings for the wide gauge, and light ones for the narrow, are erroneous and valueless, so far as showing what the difference in cost which is due to the gauge would be. Such calculations may show that a narrow gauge with a light equipment will cost less than a wide one with heavy rolling stock, but no calculation is necessary to show that, any more than it would be to prove that a big brick house will cost more than a small stone one.

*Laying light rails* on the one road would cost no more than on the other, and in a previous article we discussed the cost, or rather the difference in the quantity of grading, for each gauge. Our views expressed at that time have since been fully confirmed by the estimates made by engineers for a line of 29 miles long in a high rolling section of Virginia, both agreeing that there would be a difference in the *volume* of the grading of about 10 per cent.

A great deal has been said in this connection about the difference in expense of grading a wide and narrow-gauge road on a steep hillside, as represented by the dotted line in the engraving herewith. Suppose the material—say rock—will stand in the position represented by the line, *c d*. Now if the roadway is made two feet wider, the cutting must be carried up perhaps hundreds of feet. If the material is not rock, its natural slope will frequently be as steep as that of the cut or embankment can be made. When this is the

case it is said that the cut must be carried up all the way to the top of the hill, and the embankment carried down to its foot. Now that this might be the case in some instances is quite true, but the frequency of it will depend entirely upon the nature of the country, and the localities where it would become an important element of cost are very rare. There are also expedients—such as the erection of retaining walls—which are resorted to by engineers and would obviate to a very great extent the necessity of any considerable expense. We are ready to admit, however, that there may be localities where the difference in the amount of grading for a 3-feet and 4-feet 8½-inch road may exceed 10 per cent., but they are rare and only an actual survey and estimate therefrom will determine when such is the case.

With reference to the difference in cost of moving 10 per cent. more material, we have found considerable difference of opinion, but nearly all who have discussed this question, agree in thinking that the cost would not be in proportion to the volume, as a considerable portion of a contractors expense is for equipment, *i. e.*, horses and carts, tools and lodgings for men. The expense of these is the same whether the material to be moved is 10 per cent. more or less.

We are satisfied that few contractors would grade a road-bed 10 feet wide for 6 per cent. less than one 11 feet 8½ inches wide, and feel that it would be ample allowance for the actual difference in the cost of the grading for the two lines.

*The cost of ballast* would be in proportion to the length of cross ties.

*Siding* would cost in the same proportion to the main line of track.

*Fencing* would be the same in both cases.

*Bridges* would also cost the same, as their width is governed by that of the cars, and not of the gauge, and their strength by the *weight* of rolling stock. We desire here to impress upon our narrow-gauge friends what we have said before, that if, as they argue, there is any advantage in running narrow cars that it can be done just as well on the one gauge as on the other.

*Masonry* would be in the same proportion as the cost of embankments.

*Freight on materials* will cost the same in each case, with perhaps a very slight increase for cross-ties for the wide gauge.

*Freight and passenger houses* will be the same, if they give equal comfort and conveniences.

*Engine houses, water works and machine shops* will all be the same.

With reference to *locomotives*, we have inquired of at least four of the most prominent builders, and all agree very decidedly in saying that the cost for narrow-gauge engines will be no less than for wide, if they each shall have the same capacity. The argument so frequently used, that lighter, and consequently less expensive engines can be used on the narrow gauge than on the broad, would be very good if the cars could not be built of so nearly the same weight for the one gauge as for the other. Of course, if it were not possible to run light cars on the wide gauge, then heavy engines would be necessary, but this, as we have frequently stated before, is the leading fallacy of the narrow-gauge reasoning.

*Cars* for the wide gauge will only differ from those

of the narrow in having longer and heavier axles, weighing about 150 pounds more per car, which at six cents per pound will amount to $9. We are now referring to four-wheeled freight cars, with which narrow-gauge roads are being equipped in this country, and which it is generally practicable to use on wide-gauge roads, if there is any advantage in doing so. For eight-wheeled passenger cars the difference would be double that of those with four wheels.

*Engineering and right of way* would be the same, as it is no more work to make a location for a narrow than for a wide gauge, and the width of the right of way is governed by the width of the cars more than the gauges.

We will now sum up, premising, first, that we cannot vouch that the rates we give of the cost of all the items are quite accurate, as we have taken the data from a variety of sources, and have not the means at hand for verifying them, but we have taken them the same for each gauge, so they will not effect the *relative* cost:

ESTIMATE OF COST PER MILE OF 3-FEET AND 4-FEET 8½-INCH-GAUGE RAILROADS.

| | 3 *feet.* | 4 *feet* 8½ *in.* |
|---|---|---|
| Land and land damage | $500 | $500 |
| Grading | 3,500 | 3,710 |
| 47¾ tons of rails, 30 lbs. per yard, at $70 | 3,325 | 3,325 |
| 494 rail splices | 247 | 247 |
| 3,520 lbs. spikes, at 4½c | 150 | 150 |
| 3,520 cross-ties, 6 feet long, 5x6 inches, at 37½c | 1,320 | .... |
| 3,52[illegible] cross-ties, 7 feet 8½ in. long, 6x6 in., at 37½c. | .... | 1,584 |
| 1,[illegible]00 cubic yards ballast, at 50c | 500 | .... |
| 1,300 cubic yards ballast, at 50c | .... | 650 |
| Laying track | 300 | 300 |
| Sidings | 300 | 325 |
| Bridges | 1,000 | 1,000 |
| Masonry | 500 | 500 |
| Fencing | 500 | 500 |
| Freight on materials | 150 | 165 |
| Freight and passenger houses | 600 | 600 |
| Engine houses, repair shops and water works | 400 | 400 |
| Miscellaneous buildings | 100 | 100 |
| Engineering, salaries and office expenses | 1,000 | 1,000 |
| | $14,393 | $15,056 |

EQUIPMENT FOR, SAY, 25 MILES OF ROAD.

| | 3 *feet.* | 4 *feet* 8½ *in.* | | |
|---|---|---|---|---|
| 5 locomotives | $30,000 | $30,000 | | |
| 10 passenger cars | 20,000 | 20,180 | | |
| 4 mail and baggage cars | 2,400 | 2,436 | | |
| 100 freight cars | 17,500 | 18,400 | | |
| | $69,900 | $71,016 | | |
| Per mile | $2,796 | $2,840 | 2,796 | 2,840 |
| Total | | | $17,188 | $17,896 |

From this estimate it will be seen that the difference in cost of building and equipping a road of 3-feet gauge, and one of 4 feet 8½-inches of the same character will not be quite 4 per cent. that of the latter. It is, then, a question for those who are now contemplating the construction of narrow-gauge roads whether this slight difference will be a sufficient compensation for the inconveniences which must attend a break of gauge, and which, it must be remembered, are not lessened in the least by any difference in the cost of the two gauges. Attention has been directed so much to the difference in cost that the disadvantages of break of gauge and contracted rolling stock have been, to a great extent, lost sight of. If they were not so very great we should not so often hear of roads like the Ohio & Mississippi changing their gauge in a single day, and supplying their whole line with new equipment throughout. That narrow-gauge roads may be obliged to make similar changes is not at all improbable; and certainly the value of a light road must be very materially affected by the fact that it can be changed for heavy traffic gradually and without loss; whereas, if it is built of a narrow gauge, this could only be done suddenly and at great expense.

We doubt, too, whether the inconveniences of contracted cars ever have been, or will be, properly appreciated, until the public have had some experience in this direction; and it must also be remembered that a road which can only offer the conveniences and comforts of narrow-gauge cars will always be at great disadvantage in competing for traffic with other roads.

Danger is also an element to which travelers are very sensitive, and let any serious accident occur on a narrow-gauge line which can be attributed to the want of stability of the cars, and travel would at once abandon it and go elsewhere, if it were possible.

We may at some future time give specifications for rolling stock of a light road of 4-feet 8½-inch gauge.

## THE RAILROAD SYSTEM OF BELGIUM.

The compact and densely populated little kingdom of Belgium has a railroad system which has often been cited as an instance of the successful management of transportation by the State. From the report of the Minister of Public Works of the operations during the year 1868, we take the following facts:

At the close of the year 1868 the mileage of railroads in Belgium was as follows:

| | *Miles.* |
|---|---|
| Operated by the Government | 536 |
| " " companies | 1,160 |
| Total | 1,696 |

This may not seem a very large amount for a whole kingdom, but it must be remembered that Belgium has only an area of 11,400 square miles, that is, is about as large as the State of Maryland, and had therefore one mile of railroad to 6¾ miles of area, which is about the proportion of railroad to area in the State of Connecticut at the end of 1870, when Massachusetts had one mile of railroad to 5¼ square miles of area.

The railroads worked by the government had double track on 97 35 per cent. of their length; that is, on all but about 14 miles. There was also 273 miles of side track.

In the track there were placed during the year 505,032 meters of rails weighing more than 75 pounds to the meter (about 69 pounds to the yard) of which 464,152 meters were of the Vignoles pattern, weighing 77 pounds per yard, 40,880 meters double-headed rails weighing 78 pounds per yard. There were only 88 miles of rails weighing less than 69 pounds per yard, nearly all of which was in side tracks. Fish-joints were used on 1,175 miles of track.

Of the ties in place at the close of the year, 71 per cent. were preserved from decay by some chemical process, chiefly with creosote, by the method known as the "Bethell process."

The total cost of the 536 miles of road belonging to the government was 251,693,644.38 francs, which is nearly equivalent to $53,000,000 in American gold, —very nearly $100,000 per mile.

The equipment of the government railroads at the close of the year reported consisted of 378 locomotives, with an average of 144½ horse-power each, 276 tenders, 1,839 passenger cars, 9,065 freight cars, and 536 cars for various special purposes. Of the freight cars, 2,238 had capacity for from 5 to 7½ tons; 6,312, for ten tons; 32 for 10 to 15 tons; 106 for 15 tons; 60 for 20 tons; 3 were for carrying lime, 56 for vehicles, and 258 for stock.

The receipts from the 536 miles worked in 1868 were 41,852,331 francs, or about $8,370,000—about $15,600 per mile. The operating expenses were 24,754,068 francs, or about $4,950,000, or 59.15 per cent. of the gross receipts, which approaches the average on American railroads.

The train mileage was as follows:

| | *Miles.* |
|---|---|
| Express passenger trains | 640,411 |
| Ordinary " " | 2,832,719 |
| Special " " | 19,543 |
| Ordinary freight | 2,660,505 |
| Special " | 92,657 |
| Total | 5,745,835 |

This is equivalent to the movement of a train 10,721 times over the entire length of the system during the year —5,584 times by passenger and 5,137 times by freight trains. The car mileage for the same time was 111,156,126 miles, showing an average of 19⅓ cars per train.

The receipts per train mile were $1.35 2-5 and the expenses 80 cents.

The following were the rates which produced these receipts. The league named is 3.027 miles and the kilogramme 2.205 pounds.

ON EXPRESS TRAINS.

| | 1 *to* 5 *kil.* | 6 *to* 10 *kil.* | 11 *or more kil.* |
|---|---|---|---|
| *Carrying* 1 *to* 5 *leagues.* | .70 fr. | .90 | 1 10 |
| " 6 " 10 " | .80 | 1 00 | 1.20 |
| " 11 " 15 " | .80 | 1.00 | 1 20 |
| " 16 " 10 " | .90 | 1.10 | 1.20 |
| " 20 " 51 " | .90 | 1 10 | 1.20 |

That is, a package weighing eleven pounds or less was carried fifteen miles or less for thirteen cents, 45 miles for fifteen cents, and 150 miles for seventeen cents. packages weighing more but not more than 22 pounds were carried usually for two cents more, and still larger packages for four cents more. Another tariff on fast trains of less than express speed gives about two-thirds of the above rates.

Of the regular freight rates, those for first-class freight are not reported. For the second class there is an arbitrary charge of 18.6 per ton of 1,000 kilogrammes (2 205 pounds), and charges varying with the distance of 7.44 cents for each of the first 15 leagues, 3.72 cents for each league beyond 15 and up to 25, and 1.86 cents for each league beyond 25.

Thus for 33 leagues—about 100 miles—the charge on 2,205 pounds would be:

| | |
|---|---|
| Fixed charge | 18 6 cts. |
| For 15 leagues, 15×7.44 | 111 6 " |
| " 10 " 10×3.72 | 37.2 " |
| " 8 " 8×1.86 | 14.9 " |
| Total charge | $1.833 |

At this rate the freight on one of these tons—about twenty-two hundred—between Chicago and New York, would be, reckoning by the shortest route, about $11.75, gold, or 53½ cents per hundred, which is less than the ordinary summer rate here on second-class freight, but 50 per cent. more than the present rate from New York to Chicago.

On third-class freight there was the same fixed charge of 18.6 cents per ton, 5.58 cents for each of the first fifteen leagues, 2.79 cents for each league from 16 to 20, 1.86 cents for each league from 21 to 25, and .93 of one cent for each league beyond 25. At this rate the charge between New York and Chicago would be 18 cents per hundred.

On fourth-class freight there is a fixed charge of 18.6 cents, as before—3 72 cents per league for the first fifteen leagues, 1.86 cents per league for the next five leagues, and .93 of one cent for each additional league, which would be at the rate of 15½ cents per hundred between New York and Chicago.

Besides these, there are lower special rates, chiefly applicable to heavy raw materials used in manufactures.

The rates for passengers are not given in this report.

The data for a comparison of expenses with those of American railroads are all wanting. It is very well known that labor is cheaper in Belgium than almost anywhere else in the civilized world, and that iron especially is very cheap there, but no figures are given of the prices of materials or of the wages of employes.

## The Detroit Lansing & Lake Michigan Railroad.

The last rail on the part of this road between Detroit and Lansing, 84½ miles, was laid on the 18th inst. For some time a section of the road has been in operation from Lansing northwest through Ionia to Greenville, 58 miles, so that there is now 142½ miles of the line completed. The road was projected many years ago, and the section between Detroit and Howell and that between Howell and Lansing, under the names of the "Detroit & Howell," and the "Howell & Lansing" railroads, were in a fair way to be constructed when the famous decision of the Michigan Supreme Court deprived them of the aid which counties and towns had voted them, and left them apparently utterly hopeless. But last December a contract was made with capitalists —chiefly men largely interested in the Michigan Central Railroad—and the companies were consolidated and means assured for the completion of the line. About the same time the Lansing & Ionia Railroad was consolidated with it, and arrangements were made for an extension westward as well as the completion of the Eastern Division. The road is in no sense a feeder of the Michigan Central, though it uses, we believe, two or three miles of its track and its stations in Detroit but the control of it may prevent its competing with that road for some traffic. From Detroit to Lansing it is nearly parallel with and generally a little less than twenty miles southwest from the line of the Detroit & Milwaukee Railroad, which it crosses at Ionia, as it maintains its general northwesterly direction while the Detroit & Milwaukee turns to the west. Twenty-five miles from Detroit it is ten miles from the line of the Michigan Central; at Howell, 52 miles from Detroit, twenty miles from that road; and the distance increases further west. The country on the line is, for part of the distance, very good and well settled, and for another part, indifferent and thinly settled. There are few considerable towns on the road, Howell having a population of 2,600, Lansing of 5,300, Ionia of 4,200, and Greenville of 2,800, according to the last census. The extension to Lake Michigan will be through a new country, which is likely to grow when it is made accessible. Altogether it will be about 200 miles long, reaching Lake Michigan in the vicinity of Pentwater. It is not improbable that it will have close relations with some of the new Wisconsin railroads across Lake Michigan, which it will give a short eastern outlet.

With the completion of this road, and perhaps one shorter between it and the Flint & Pere Marquette Railroad, all that part of Michigan south of Saginaw Bay will be well provided with railroads, as there will be scarcely a township more than twelve miles from one.

## The Charities of Railroads.

In the course of a sermon preached in Grace Church, Chicago, on the 20th inst., the Rev. Clinton Locke said:

"Look at one thing: the charities of railways. I mention them in this connection because they are not things we connect with religion, and their having "no souls" is a stock newspaper phrase.

"Why should railways give half-fare to ministers any more than a bakers' association should do their baking for half price, or a company of grocers sell their goods at a great discount? Yet all these railways gracefully do it—a magnificent charity—amounting in this city alone to thousands of dollars, enabling Christian ministers to do a vast deal of good and enjoy a great deal of pleasure. And more than this: no one outside of their own offices dreams of the immense charities they do the sick and poor, transporting them everywhere free of charge, bringing freight for them, and, with the express offices, untold quanti-

ties of wood, and coal, and food to charitable institutions. You go to any railway office with a well-deserving case of charity and you will be heard courteously, and never refused. They need not do one thing of this. It is not in their bond. But that blessed charity which daily spreads wider through the world prompts them to it. They do not boast of it; but it gives me great pleasure to speak of it, for I owe them a heavy debt of gratitude."

This is well and truly said. The charities dispensed by the railroad companies in this city surpass in amount the entire disbursements of many a charitable institution. While the great public is not aware of and will hardly believe in the generosity of what they are apt to consider an institution wholly given to money-making, those who need charity and those who are accustomed to dispense it, as ministers or agents of charitable institutions, have long ago learned that in railroad offices a deaf ear is never turned to a reasonable appeal for any service which a railroad company can give. It may be questioned whether a corporation should not leave it to its individual members to bestow any part of its earnings in charity, but we believe that there has been no complaint on the part of the stockholders of our railroad companies because their property has been used freely to relieve the needy and distressed.

## West-Bound Freight Rates.

The sharp competition of the different railroad lines westward from New York,—each vieing with the other in charging the lowest freight rates—and the combination of the rail routes against the steamboat lines around the lakes, has had the effect to reduce the carrying prices lower than they have been at any time during the last ten years. Just at a time, too, when western wholesale dealers are transporting their heaviest stocks, the freight lines find their cars employed to their fullest capacities, at prices which can scarcely cover the cost of transportation. On Thursday of this week the following prices had been agreed upon for first, second and third-class freights from New York westward:

To Cleveland, 23c; Sandusky, 28c; Columbus, 28c; Dayton, 31c; Cincinnati, 32c; Toledo, 27c; Louisville, 38c; St. Louis, 45c; Cairo, 45c; Fort Wayne, 33c; Atchison, $1.05; Kansas City, $1.00; St. Joseph, $1.00; Chicago, 35c; Milwaukee, 40c; Detroit, 25c; Kalamazoo, 35c; Grand Rapids, 35c; steam rates on Lake Erie, from Dunkirk and Buffalo west to Chicago, Toledo, and Detroit, 20 cents; steam around lakes to Chicago and Milwaukee, 24 cents.

To Chicago the special rate is 26 cents, and 35 cents for the first four classes. It is possible that the bottom price is not yet reached, it being usual in such cases to cut the rates until the folly of it is apparent to the craziest.

## Railroad Earnings in July, and from January 1 to August 1.

There is a more general increase in the returns of railroad traffic for the month of July than for several months previously, only one road, of those included in the following table, showing a decrease compared with July of last year. On several roads the increase is quite conspicuous; Chicago & Alton shows $117,133; Cleveland, Columbus, Cincinnati & Indianapolis, $65,495; Illinois Central, $87,638; Michigan Central, $95,124; Toledo, Wabash & Western $231,-238; and Union Pacific, for the first time this year, shows an increase in gross earnings amounting to $51,-213. In regard to the last company there has been much comment upon the large increase of *net* earnings reported for the first six months of the current year, amounting to $665,318, while the *gross* traffic has been $387,632 less. It has even been suggested that the accounts of last year must have been kept in an unusual manner, and made to include items not properly belonging under the head of earnings, as it is supposed the business of the Pacific railroads has largely increased, and must steadily increase with each successive year of their operation. In the absence of details from the company's books, however, it is impossible to give the items which go to make up the results given each month to the public. We have heretofore called attention to the fact that the statements of the Chicago & Northwestern company showed samewhat similar results to those of the Union Pacific; and in the annual report just issued, the gross earnings for the year ending May 31st, 1871, shows a decrease of $840,514, compared with the previous year, while the net earnings are $20,774 more than in 1870.

The change of gauge on the Ohio & Mississippi road, which was effected in one day on the whole line from St. Louis to Cincinnati, must be regarded as one of the most important events that has recently occurred in railroad affairs. The change is in favor of the Baltimore & Ohio road, and the New York Central & Hudson River lines, and adverse to the interests of the Erie and Atlantic & Great Western. The advantage to the Ohio & Mississippi may not appear fully in their gross traffic returns, as a large part of the gain should be in a saving of expenses, the results of which would only appear in a statement of net earnings.

Taken altogether, July, the first month of the new half year, has been very favorable, and the results of operation are generally satisfactory.

RAILROAD EARNINGS IN JULY.

| | 1871. | 1870. | *Increase.* | *Decrease.* |
|---|---|---|---|---|
| Central Pacific | $819,100 | $788,099 | $36,001 | .... |
| Chicago & Alton | 535,842 | 418,709 | 117,133 | .... |
| Cl'v'd, Col., Cin. & Ind. | 314,850 | 249,355 | 65,495 | .... |
| Illinois Central | 714,853 | 627,215 | 87,638 | .... |
| Marietta & Cincinnati | 118,572 | 111,127 | 7,445 | .... |
| Michigan Central | 422,015 | 326,891 | 95,124 | .... |
| Milwaukee & St. Paul | 481,113 | 636,434 | .... | $155,321 |
| Ohio & Mississippi | 211,353 | 211,219 | 133 | .... |
| Pacific of Missouri | 287,540 | 279,462 | 8,078 | .... |
| St Louis & Iron M't'n | 118,016 | 107,524 | 10,492 | .... |
| Toledo, Wabash & W'n | 553,904 | 322,756 | 231,238 | .... |
| Union Pacific | *691,670 | 643,458 | 51 212 | .... |
| Total | $5,271,917 | $4,717,949 | $709,889 | $155,321 |

*Approximate.

For the seven months of this year, now elapsed, earnings in most cases show a gain of a large percentage over the same in 1870; and when we consider the very large increase in railroad mileage at the West, and the consequent distribution of traffic which necessarily takes place, the continued large business enjoyed by all the leading roads affords a new evidence of their strength, and encourages the confidence which has been so generally placed in railroad investments judiciously made. The prosperity of many of these roads is unquestionably sustained to a great extent by their local traffic, as this always affords a class of business which cannot be destroyed by competition.

EARNINGS FROM JANUARY 1 TO AUGUST 1.

| | 1871. | 1870. | *Increase.* | *Decrease* |
|---|---|---|---|---|
| Central Pacific | $4,924,920 | $4,210,463 | $714,457 | .... |
| Chicago & Alton | 2,918,332 | 2,524,131 | 394,201 | .... |
| Clev'd, Col., Cin. & Ind. | 2,032,793 | 1,701,580 | 331,213 | .... |
| Illinois Central | 4,549,748 | 4,470,983 | 78,765 | .... |
| Marietta & Cincinnati | 869,357 | 728,234 | 140,832 | .... |
| Michigan Central | 3,103,766 | 2,555,940 | 547,826 | .... |
| Milwaukee & St. Paul | 3,409,223 | 3,722,635 | .... | $312,913 |
| Ohio & Mississippi | 1,655,643 | 1,646,494 | 9,149 | .... |
| Pacific of Missouri | 1,908,479 | 1,892,364 | 10,715 | .... |
| St Louis & Iron Mount'n | 873,233 | 730,635 | 142,618 | .... |
| Toledo, Wabash & West'n | 2,978,148 | 2,177,585 | 800,563 | .... |
| Union Pacific | 4,104,954 | 4,441,374 | .... | 366,420 |
| Total | $33,328,744 | $30,807,718 | $3,17 ,359 | $649,333 |

—*Commercial and Financial Chronicle.*

# Contributions.

## NARROW-GAUGE RAILROADS.

To the Editor of the Railroad Gazette:

Of late much has been said and written of the narrow-gauge railways. Many engineers and practical men have entered into the discussion, each, no doubt, expressing views, the results of his own individual investigation. Of all the different gauges that are at present in use, there seems to be room for finding some very grave errors in all of them, in some particular or other, and there appears to be a general desire to obtain a gauge that will give the greatest combined advantages. That the various gauges now in use in the United States must ultimately emerge into one standard gauge is doubtless.

Cars laden with merchandise and produce, shipped from the West to the East, either undergo a reshipment at the points where the gauge changes (if it be so great as to compel it), or must be hauled part of the way on one gauge and part on another, necessitating no little increase of cost of transportation.

In the United States, narrow-gauge railways are for the present an experiment, but that similar experiments in other countries have proved successful is not gainsaid by any. That they are practicable needs no further demonstration than the results of actual experiments have shown.

In Norway and Sweden they have been used, and give results very much in their favor. There are many who, when the subject of narrow-gauge railroads is propounded, discountenance the idea as a vain theory, or a mere experiment, and characterize them as diminutive and frail. Were it intended that each car on the narrow gauge should carry the same amount and weight of freight as each car on the broader gauges, this assertion would be true; but such is not the case. The object of the narrow gauge is not only a saving in first cost, but also of the weight in the transportation of freights—or, in other words, gaining greater capacity in proportion to the weight of car.

In different countries, and at the present time, there are upwards of thirteen different gauges in use, and of this number nine are in use in the United States. Cars on the 4-feet 8½-inch gauge run also on the 4-feet 9-inch and 4-feet 10-inch gauges. This alone is productive of a waste of machinery and extra expense enough in a few years to pay for adopting a more uniform gauge in our system of railroads on the start. There are other operations of similar nature, such as using telescope axles, that may be adapted to any gauge in use, and the lifting of car-bodies from their trucks on one gauge to other trucks on another gauge, all of which is accomplished with no little expense and delay.

Yet in calculating the advantages to be derived from the narrow gauge, there is a limit that must be recognized, where the practicability of building a *first-class* narrow-gauge trunk railway must cease. It has been thoroughly shown that narrow-gauge railways of three feet, two and a half feet, and even the Festiniog Railway of only 23½ inches are a success, but they cannot be rated as *first-class*, except, perhaps, in the country through which they run.

From all that has been demonstrated theoretically or practically of narrow-gauge railroads, the 3-feet 6-inch gauge seems to meet the approbation of engineers and scientific men more generally than the narrower gauges. However, there is no gauge but has its advocate. As to the difference in cost between the 3-feet 6-inch and the 4-feet 8½-inch gauge, it is plain to be seen that the percentage is in favor of the former. In the cost of grading there is a saving of about ten per cent., and in other details the percentage in favor of the 3-feet 6-inch gauge is much greater.

Below is given a fair estimate of the cost of superstructure, for one mile of road, of both the 4-feet 8½-inch and the 3-feet 6-inch gauge of such articles as average about the same in quantity on their respective gauges, either on a straight line or with curves, in a level or hilly country:

THREE-FEET SIX-INCH GAUGE.

| | | |
|---|---|---|
| 61 3-5 tons rails (35 lbs. per yard) at $72.00 | | $4,435.20 |
| 3,200 | lbs. spikes at .04½ | 132.00 |
| 3,168 | cross-ties at .37½ | 1,188.00 |
| 600 | cubic yards ballast at .25 | 150 00 |
| 660 | fish-joints, with bolts, at .50 | 330.00 |
| Distributing material and laying track | | 300.00 |
| Total for one mile | | $6,535.20 |

FOUR-FEET EIGHT-AND-A-HALF-INCH GAUGE.

| | | |
|---|---|---|
| 98 3-5 tons rails (56 lbs. per yard) at $72.00 | | $7,079 20 |
| 4,000 | lbs. spikes at 04½ | 165 00 |
| 3,168 | cross ties at .50 | 1,584 00 |
| 775 | cubic yards ballast at .25 | 193 75 |
| 660 | fish-joints with bolts at $1.00 | 660 00 |
| Distributing material and laying track | | 450 00 |
| Total for one mile | | $10,131 95 |

The difference in the cost of the two gauges from the above estimates is $3,596.75, and the percentage of difference to cost of broad gauge equals 35½ per cent.

In the above estimates iron rails are calculated for, but this matters not, for whatever difference there is between the cost of iron and steel rails will show proportionately as much in one as in the other. The articles above enumerated are calculated for at quotation prices at the mill.

Bridges to be used for the narrow gauge might be built narrower than those for the broad gauge, and would cost from fifteen to twenty per cent. less than for 4-feet 8½-inch gauge, and in rolling-stock there would likewise be an economy of first cost amounting to 30 per cent. There has already been a beginning made of constructing light rolling-stock for narrow-gauge railways.

The box cars built for the Denver & Rio Grande Railway are about fourteen feet long and placed on four wheels. The object of building box freight cars of such dimensions and mounting them on four wheels seems wholly for the purpose of lightening the rolling stock without considering the capacity. Why shorten them so as to be compelled to place them on four wheels like a coal car? Why not lengthen them to say twenty feet and place them on two four-wheeled trucks? They would ride much easier, and a gain of capacity greater in proportion to increase of weight would be had.

A car twenty feet long, seven feet and a half wide, and six feet ten inches high, would have a capacity of 1,000 available cubic feet, and mounted on two four-wheeled trucks would weigh about 10,000 pounds.

Such a car loaded with grain would have a capacity for 22,500 pounds of wheat, 21,000 pounds of corn, and 12,000 pounds of oats, respectively; whereas, a car on the 4-feet 8½-inch gauge weighing 20,000 pounds would only have a capacity for grain, as follows: for wheat, 37,000 pounds; for corn, 34,600 pounds, and for oats, 19,700 pounds, respectively. So that a car on the 3-feet 6-inch gauge of the above dimensions has an average capacity for about double its weight; while on the 4-feet 8½-inch gauge a car (such as are at present in use) has an average capacity for about one and a half times its own weight. But freight cars on the broad gauge seldom carry their own weight; then to deduct from the above results proportionately for each gauge, we have, when the box car on the 4-feet 8½-inch gauge only carries its own weight of load, the car on the 3-feet 6-inch gauge carries one and a half times its load.

Now, as the above calculation is only for a single car on the two gauges, we will take a number of cars in a train, and see what advantage is gained, and where:

For example, load a train of cars on the 4-feet 8½-inch gauge with 200,000 pounds, and we find that it takes just ten cars; on the 3-feet 6-inch gauge it takes thirteen and a third cars. As the cars on the 3-feet 6-inch gauge weigh 10,000 pounds each, we have for the dead weight of the train on the narrow gauge, 133,000

pounds, and on the broad gauge, 200,000 pounds, showing a difference of 66,000 pounds, or 33 per cent. less dead weight to load in favor of the 3-feet 6-inch gauge.

It has been asserted by some engineers and practical men, that cars on the 3-feet and 3-feet 6-inch gauges will carry from two to two a half times their weight. Figures can be made to show it, but will practice prove it?

For passenger traffic, coaches can be made equally as commodious and comfortable as on the broad gauge.

A coach on the narrow gauge that would seat thirty-five passengers would weigh about 14,000 pounds; while on the 4-feet 8½-inch gauge the coaches now in use, weighing 34,000 pounds, seat sixty passengers. Thus, a passenger coach on the narrow gauge, weighing a little more than one-third as much as a broad-gauge coach, carries more than one-half as many passengers.

For turning acute curves the advantage is in favor of the narrow gauge, but whatever can be gained in this particular should not be abused; for wherever a line of railroad may be situated, it should be made as straight as possible, at the same time considering well the subject of economy of construction and maintenance of permanent way. In all the countries where the narrow-gauge railroads have been used, the line of road has been over a mountainous section of country, necessitating very heavy gradients and acute curves, and yet, when compared with the broad gauge, has in every instance exhibited advantages in its favor.

In the United States there is not that continued series of mountain ranges collected so near together as in Norway and Sweden; but with the exception of the Alleghany and Rocky mountains the country is rolling, and west of the Mississippi for a thousand miles is indeed almost a level plain. Now if the narrow-gauge railroad will in a mountainous and an extremely rough and rugged country give such good results, why will it not give proportionally much better results in a section of country better adapted to railroads of any gauge?

Already several, and lengthy, narrow-gauge railroads are in process of construction in the United States, and as important results are claimed to have been arrived at in theory, we must patiently await the developments of time and experience for the results of practice.

L. M.

[Some remarks relating to the above will be found on our editorial page.—Editor Railroad Gazette.]

## THE EFFECT OF CURVES.

To the Editor of the Railroad Gazette:

Much as I am disposed to accept the criticism of the Editor on my article published in your number of the 5th inst., on the resistance experienced by trains on curves, there are certain points in your comment which you have omitted to take into consideration.

That centrifugal force is one cause of the slipping of the wheels when on a curve, I must deny, for the following reason: The direction of this force is that of the tangent to the curve; and its component (opposed to which is the centripetal force) is in the direction of the radius of the curve. Hence its tendency, as producing slip of the wheels, is in the direction of their axis. But the friction of the wheel due to the weight of the car is so great that slip is impossible in that direction. We must therefore look to some other cause for the tendency of the wheel to run on its outer diameter on a curve. It might be argued, with great plausibility, that since on a straight track the wheel inclines toward the higher rail, the same is true on a curve. But we throw this entirely aside. Were both wheels of the same size, *i. e.*, not coned, their tendency would be to run toward the outer rail; that is, the wheels would tend to follow the direction of the tangent to the curve. Omitting the further elucidation which will be brought in in your second paragraph, I pass on to its consideration.

You say: "Theoretically the wheels may be so coned, "and the outer rail of a curve so elevated, that, for an "assumed speed, there will be no slipping and no "friction of the flanges against the rail." If this were so, and the wheels were coned a little more than the theoretical amount, on your assumption, the tendency of the wheels would be to run toward the inner rail. Now it is a fact that the inside of the outer rail on a curve is worn; but the flange side of the inner rail never. There must be cases where the curve is so gentle that your theoretical amount of coning required would be exceeded; yet in no case has the inner rail been found worn.

And now allow me to inform you where your theoretical case is deficient, and what you did not think to take into consideration.

You should have said: Theoretically, *if the axles are set radially to the curve and the gauge allows the proper side-play*, the wheels may be so coned *and the radius of the curve be such* that there will be no slipping and no friction of the flanges against the rail. It will be noticed that I have italicised what I have added, and left out "and the outer rail of a curve so elevated that "for an assumed speed," and that I leave out the consideration of speed altogether—that only producing the centriful force whose non-influence I have just shown.

As practically the axles on each truck must remain parallel, the discussion of the above correct theoretical assumption is futile. We will assume, then, that the axles are parallel, and that the wheels are coned so as to obviate all slip (taking into consideration the radius of the curve and the play between the flange and the rail). The last condition is required, because the greater the play between the flange and the wheel, the greater the difference between the two diameters which run on the inner and outer rails. From this follows the second condition, *i. e.*, that of the radius of the curve; for the greater the difference of the just-mentioned diameters, the greater the angular change in the direction of motion of the wheels; which angular change must be such as to bring this direction of motion parallel to the tangent of the curve at a point opposite to the middle of the truck. This assumed case gives the conditions for the easiest running.

An examination of one of the above conditions will suggest the practical importance of having the gauge and the distance apart of the wheels proper and uniform in amount, that there may be less play on easy than on sharp curves; or that the gauge should be a trifle less on the former than on the latter.

To understand the effect of having the axles parallel, let us take an extreme case, where we suppose the axles to be far apart, and the curve as having a short radius. Now, since the direction of motion of the truck is parallel to a tangent to the curve at a point half-way between the axles, the flange of the outer forward wheel must come against the rail at an angle—which angle varies, as I stated in my last article, with the distance between the axles and the sharpness of the curve; and it is for this reason that the outer rail is worn and never the inner one.

The object of elevating the outer rail is not, as you have assumed, to counteract the supposed slip due to the centrifugal force, but that the line of the center of stability may fall midway between the rails. You will find this idea brought out in those elementary books discussing this question.

Finally, that there is an increase of rolling friction due to centrifugal force, I admit; but by comparing the components respectively of gravity and of centrifugal force, or rather by determining their resultant, we find that this increase is very small—practically too small to be at all regarded, especially on easy curves. A.

[Our correspondent, in the first place, denies a statement which was not made, namely: "that centrifugal "force is one cause of the slipping of the wheels "when on a curve." The statement in the criticism referred to was, in effect, that the centrifugal force—which is in the direction of a tangent to the curve—forces the outer wheels upon their larger diameters, and thus *prevents* a portion of the slipping due to the outer rail being the longest and the number of revolutions of the outer and inner wheels being equal.

The correspondent's inference from the quotation in the second paragraph is incorrect. While it is true that an excessive coning has a tendency to cause the wheels "to run toward the inner rail," there exists also the same tendency to force them toward the *outer* rail, so that it is unnecessary to look for wear upon the inner rail from this cause.—Ed. Railroad Gazette.]

—The *Canadian Monetary Times* reports as follows the earnings of railroads of the Dominion of Canada for the month of June:

| Name of Road. | *Passengers.* | *Mails and Sundries.* | *Freight.* | *Total, 1871.* | *Total, 1870.* | *Miles.* |
|---|---|---|---|---|---|---|
| Gt. Western | $124,990 | $8,364 | $196,913 | $330,267 | $295,259 | 351½ |
| Gr'd. Trunk | 239,747 | 24,000 | 368,054 | 625,861 | 568,570 | 1,377 |
| Lon. & Pt.S. | 2,446 | 118 | 2 712 | 5,276 | 4,301 | 24½ |
| Welland.... | 1,802 | 1,242 | 11,443 | 14,487 | 4,515 | 25 |
| Northern .. | 18,856 | 4,465 | 59,051 | 82,372 | 70,914 | 97 |
| Mid. of Can. | 4,074 | 274 | 28,523 | 32,871 | 33,964 | 56 |
| C. P. & M.. | 132 | 6,612 | 3,116 | 6,744 | ..... | .... |
| St. L. & O .. | 5,544 | 974 | .... | 9,634 | 11,073 | 84 |
| St. L. & In. | 311 | .... | 460 | 771 | 734 | .... |
| N. B. & Can | 2,330 | 300 | 18,1 2 | 20,729 | 13,060 | 116 |
| Eu.& N. A. | 11,099 | 863 | 13,702 | 25,664 | 19,438 | 108 |
| Nova Scotia | 11,997 | 819 | 17,168 | 29,984 | 26,786 | 145 |
| Total..... | $417,318 | $48,031 | $719,944 | $1,184,593 | $1,047,604 | 2,354 |

—The earnings of the Burlington, Cedar Rapids & Minnesota Railroad, 162 miles, for the first two weeks of August were as follows: For the week ending August 7, $12,272; for the week ending August 14 $14,206. At this rate the earnings for the year will be about $4,500 per mile.

# General Railroad News.

## ELECTIONS AND APPOINTMENTS.

—At the organization of the Parkersburg, Ripley & Charlestown Railroad Company, at Charlestown, W. Va., on the 14th inst. (noticed on page 236 of the Railroad Gazette), the following directors were chosen: John J. Jacob, Governor of West Virginia; Judge R. S. Brown, James A. Smith, Ravenswood; John P. Hale, C. C. Lewis, William A. Quarrier, Isaac N. Smith, Joseph Shields, J. Brisben Walker, Charlestown, W. Va.; J. J. Jackson, Ex-Gov. William E. Stevenson, M. C. C. Church, Parkersburg, W. Va.; Hon. James L. McLean, Winfield, W. Va. J. Brisben Walker was chosen President, Gen. J. J. Jackson, Vice-President, and C. C. Lewis, Treasurer. Mr. A. J. Vosburgh has been appointed Chief Engineer.

—On the 21st inst. the annual election of the Central Pacific Railroad Company was held at Sacramento. The following directors were chosen: Leland Stanford, Mark Hopkins, William E. Brown, C. H. Cummings, E. H. Miller, Jr., Sacramento, Cal.; C. P. Huntington, of New York, and Robert Robinson. All these were members of the former board except Robert Robinson, who succeeds Charles Crocker, of Sacramento, who was General Superintendent of the road during its construction, and has been since Second Vice-President.

—J. H. Sheldon has been appointed Superintendent of the new Gilman, Clinton & Springfield Railroad, with headquarters in Springfield. J. H. Lane, Teller of the State National Bank of Springfield, has been appointed Secretary and Auditor of the same road, and will enter upon his duties September 1.

—At a meeting of the shareholders of the Virginia & Maryland Railroad Company at Nokesville, Prince William County, Va., on the 22d of July, a majority of the commissioners and all of the shareholders were represented, and the company was organized. The following shareholders were elected directors: Governor Henry D. Cooke, Alexander R. Shepherd, Hon. Isaac D. Budd (of Loudoun), J. A. Partridge, J. V. W. Vandenburgh, Chauncey H. Snow (of Prince William), and Alexander Johnston. The directors then held a meeting and elected the following officers: President, Governor Henry D. Cooke; Vice-President, Chauncey H. Snow; Treasurer, Major J. V. W. Vandenburgh; Secretary, Alexander Johnston. An Executive Committee, consisting of the Hon. Isaac D. Budd, Alexander Johnston and the President was appointed.

—The following gentlemen have been chosen directors of the Raleigh & Gaston Railroad Company for the ensuing year: Wm. J. Hawkins, Paul C. Cameron, A. M. McPheters, J. B. Batchelor, George Little, Walter Clark and S. S. Royster. The officers are: President, William J. Hawkins; Superintendent, A. B. Andrews; Treasurer, W. W. Vass. Dr. Hawkins is also President of the Chatham Railroad Company, largely owned and controlled by the Raleigh & Gaston Railroad Company.

—The stockholders of the Peoria & Springfield Railroad Company met in Peoria, on the 16th of August, and elected the following directors: James Haines and D. T. Thompson, of Pekin; A. J. Hodges and Sidney Pulsifer, of Peoria; John T. Stuart, John Williams, James C. Conkling and George N. Black, of Springfield; Milem Alkire, of Menard County. The officers elected were: President, James Haines; Vice-President, James C. Conkling; Secretary, George N. Black; Treasurer, Sidney Pulsifer; Attorney, A. J. Ware; Executive Committee, James Haines, *ex officio*, John C. Conkling, John T. Stuart, A. J. Hodges, Milem Alkire; Committee on Accounts and Claims, Jno. Williams, Sidney Pulsifer, Geo. N. Black.

—Mr. Chas. Hamilton, formerly Resident Engineer of the Rockford, Rock Island & St. Louis Railroad, has been appointed Chief Engineer of the Rockford Central Railroad, with headquarters at Rockford.

—The annual meeting of the stockholders of the Cape May & Millville Railroad Company was held at CapeMay on the 10th inst. The old board was re-elected with Col. John G. Stevens as President, George J. Robbins, Secretary, and B. F. Lee, Treasurer.

—John H. Barrett, of Henderson, Ky., has been chosen President of the Evansville, Henderson & Nashville Railroad Company, in place of Gen J. T. Boyle, deceased.

—Mr. A. H. Askin, late in the employ of the Great Western Railway Company, has been appointed Chief Engineer of the Hamilton & Erie Railway.

## PERSONAL.

—A Montana paper says that Mr. Roberts and other persons connected with his engineering party on the Northern Pacific Railroad, were poisoned at their camp by eating bread which had been drugged. A physician saved them from death. It is supposed that the poison was given by an employe of the party, but for what reason it seems is not known. The Mr. Roberts is, we believe, Mr. Thomas P. Roberts, who has charge of a party, and not Wm. Milnor Roberts, the Chief Engineer.

—Last week the employes of the Chesapeake & Ohio Railroad shops in Richmond, Va., presented the Master Machinist, Mr. W. G. Freeman, with a sum of money intended to defray the cost of an artificial leg in place of one he has lost.

—Mr. F. R. Delano, for the past nine years Superintendent of the St. Paul & Pacific Company, has tendered his resignation, to take effect on the 1st of September. President Geo. L. Becker, in accepting the resignation on behalf of the directors, said: "I am authorized, on their behalf, to express to you their entire satisfaction with the fidelity, energy and ability which has characterized the whole course of your long con-

nection with the management of these lines. No man can command more enduring or convincing evidences of integrity and zeal in a position of great trust and of high responsibility than those which illustrate your career as superintendent of this company."

—On Thursday evening of last week the officers and employes of the Pullman Palace Car Company presented to Mr. A. B. Pullman, the General Superintendent, a very fine horse, carriage and harness, as a testimonial of their respect and esteem on his leaving that position to accept the vice-presidency of the company, to which he was chosen some time ago.

—Mr. Carl Pihl, who designed the Norwegian railroad system of 3½-feet gauge, and is widely known in Europe as an engineer of great ability and distinction, was in Chicago last week. He visited Toronto this week to be present at the opening of the Toronto, Grey & Bruce and the Toronto & Nipissing roads, which have been constructed very much after his designs.

—J. H. Gardner has resigned his position as General Superintendent of the Southern Minnesota Railroad in order to take charge of the work of the extension of the Jacksonville, Pensacola & Mobile Railroad through West Florida, he being one of the contractors. His present address is Quincy, Fla., now the western terminus of the road.

## OLD AND NEW ROADS.

### Denver & Rio Grande.

A large lot of iron for this road has arrived at New Orleans, and is now forwarding to Denver. A few miles of track, about the depot and machinery shops at Denver, is already laid, and track-laying from there southward was to have commenced this week.

### California Pacific.

The San Francisco *Call* reports that the final transfer of the property of this company to the Central Pacific will be made on the first of October.

"The steamer Capital has been drawn off from the Vallejo route to receive such repairs as will render her suitable for conveying overland passengers comfortably and securely to and from this city. A portion of these repairs will consist in providing bath-tubs, brushing-rooms, and other apartments where passengers may cleanse themselves from the accumulated dust of the overland trip, in order to be in presentable condition on their arrival at their respective hotels."

### Chicago & Northwestern.

The track on the Baraboo Air Line was laid across the Wisconsin River bridge at Merrimack, 11 miles southeast of Baraboo on the 15th of August. It is expected to have the lines completed to Baraboo as early as the 10th of September. The Merrimack Bridge is 1,900 feet long, composed of 1,300 feet of trestle work, 3 spans of Howe truss, each 150 feet, and one draw, 150 feet. The bridge is 45 feet above low-water mark, built on pile foundations, with no masonry, and cost $65,000.

### Chicago, Dubuque & Minnesota.

The bridge over the Turkey River, 28 miles northwest of Dubuque, is now being placed in position. Mr. F. E. Hinckley has the contract for all the bridging on this line. The iron will be laid to the river by the latter part of next week.

### St. Louis & Southeastern.

Track-laying on both sections of this road, from Mt. Vernon, Ill., and Enfield eastward, is progressing at the rate of three-fourths of a mile a day. The track was to have reached to Carmi, about 8 miles east of Enfield, on the 23d. The bridge at Carmi, ever the Little Wabash, is to be completed next month; meantime the track-layers will be taken to work on the section between Enfield and McLeansboro.

The grading between Mt. Vernon, Ill., and the Wabash bridge is to be finished next month, and the track is to reach McLeansboro from the west by the 20th of September.

### Kansas Railroad Projects.

A correspondent writes from Topeka under date of the 16th, as follows: "The voting of bonds for railroads is going on lively throughout this State just now. On the 11th inst. Sedgwick County voted $200,000 bonds for the Atchison, Topeka & Santa Fe Railroad to extend the road from Newton to Wichita (27 miles directly south of Newton) by 534 majority. On the 15th Marion County voted $200,000 to the Kansas & Nebraska Railroad (Junction City to Wichita), by 66 majority. Leavenworth County voted $250,000 of that county's Kansas Pacific bonds to the Kansas Central Narrow-Gauge, 50 miles to be built the first year, and 100 per year thereafter. The Kansas Pacific folks now talk of selling their Leavenworth Branch to the Leavenworth, Lawrence & Galveston Company, and building a first-class road from Leavenworth to Topeka. This would give them a more direct route to Chicago from Western Kansas. The Lawrence & Pleasant Hill Company is asking aid to run its road up the south side of the Kaw River to this place, and west to near Junction City or Council Grove on the Missouri, Kansas & Texas. This company's directors and stockholders hold a meeting on the 18th inst., in Topeka, to determine whether they will build a branch from Lawrence to Carbondale, a point 18 miles southwest of Topeka. This would place Kansas City and Lawrence more convenient to coalfields, and give a more direct route to St. Louis from the southwest part of this State. A project for a road from Topeka to Lincoln, Neb., thus connecting the two capitals, is agitated."

### Chicago, Clinton & Dubuque.

This is the title of the reorganization of the Dubuque, Bellevue & Mississippi Company. The road is to be built from Dubuque down the Mississippi River to Clinton, and have a Chicago connection by way of the Chicago, Burlington & Quincy road, and an extension of its Mendota & Prophetstown Branch, which is to be built from Prophetstown to Clinton. The Burlington & Quincy Company has already given orders for the construction of this extension, and will, in a very short time, be ready to receive proposals from contractors. The contracts have already been let for the grading from Dubuque down the river to Sabula.

### Bloomington & Ohio River.

The iron is laid on this road from Bement, on the Toledo, Wabash & Western road, south, about 25 miles, through Lovington, to Sullivan. Ralph Plumb & Co. are building the road, and expect to have it completed to Windsor, on the Indianapolis & St. Louis road, this season. The ties are delivered and the iron purchased and on the way from Montreal.

### Chicago & Iowa.

It is expected to have the grading of this road completed from Oregon, its present terminus, to Forreston by the latter part of September. The iron will be laid to a connection with the Illinois Central some time in October.

### Central Pacific.

The San Francisco *Chronicle* of the 10th inst. gives the following account of the proposed tunnel through the Sierra Nevada to Lake Tahoe:

"Colonel A. W. Von Schmidt has secured the co-operation of the Central Pacific Railroad Company, and will immediately commence work upon his great enterprise of tapping the waters of Lake Tahoe, and bringing them to a point on the Alameda shore opposite to San Francisco. The surveys show the project to be entirely feasible, requiring only capital and perseverance. The railroad company was the possessor of certain water rights in the Truckee River, with which Von Schmidt's dam threatened seriously to interfere. Rather than go to the vexatious delay and expense of a law-suit, like sensible men the railroad directors and Von Schmidt put their heads together, and the result is entire harmony and accord. Von Schmidt found that it would be necessary to pierce a long tunnel through the Sierra Nevada Mountains, through which to carry the waters of the lake. He suggested to the railroad company the idea of cutting the tunnel high and wide enough to be used as a railroad passage as well as a water-duct. The railroad company took the matter under consideration, found that such a tunnel would save an elevation of one thousand feet, enabling them to dispense with their costly system of snow-sheds, and decreasing the cost of transportation. They accepted the proposal of Colonel Von Schmidt; the contract has been signed; the tunnel will be cut through, and instead of running over the Sierra Nevada Mountains the railroad will go through them. It is thought that three years will be required to complete the tunnel, although the contract allows it to be done within five years. But as the colonel is a man of great determination and go-aheadativeness, it may be expected that the work will be completed in the shortest possible time. San Francisco is assured of a bountiful supply of pure water, and all reasonable anxieties on the subject ought to be dissipated."

### Cincinnati, Hamilton & Dayton.

We gave lately an account of the contract for a lease of the Cincinnati & Indianapolis Junction Railroad to this company, and we now take from the Cincinnati *Gazette* the terms of the contract by which this road is to have the Cincinnati business of the Grand Rapids & Indiana and the Cincinnati, Richmond & Fort Wayne roads:

"1. A lease of the road from Richmond to Fort Wayne, when finished, to the Grand Rapids & Indiana Company, for the term of fifty years, at the actual cost of running it.

"2. A mutual contract between all the parties for an exchange of business by the line thus formed, giving to the Cincinnati, Hamilton & Dayton Railroad Company an exclusive right to the business of the new road and of the Grand Rapids & Indiana road, to and from, and by way of Cincinnati.

"3. A provision by which the new line is to be supplied with machinery and rolling stock by the three other companies in equal proportions, for which an allowance of ten per cent. per annum on the appraised value thereof is to be made and charged as part of the running expenses, the property so contributed, however, to remain the joint property of the parties furnishing it.

"4. The three companies, so using the Richmond & Fort Wayne road, also, agree that in case in any year the net earnings of the road shall be insufficient to pay the interest, at seven per cent., on $1,800,000 of bonds, issued for its construction, they will jointly, and in equal proportion, contribute the amount of the deficiency, to be paid, with interest, out of the future earnings of the road."

### Intercolonial Railway.

The report of the Commissioners of the Intercolonial Railway of Canada is prepared. The following contracts were tendered for at prices varying from:

| | | |
|---|---|---|
| Quebec, No 13—20½ miles | $738,000 to | $1,413,083 |
| Quebec, No. 14—23½ miles | 220,600 to | 500,000 |
| New Brunswick, No. 15—12 miles | 316,4 5 to | 655,319 |
| New Brunswick, No. 16—18¾ miles | 206,000 to | 426,761 |
| New Brunswick, No. 3—24 miles | 438,480 to | 831,659 |
| Novia Scotia, No. 4—27 miles | 375,543 to | 621,584 |

The following were awarded:

No. 13—W. E. Macdonald & Co., for the sum of $934,833. No. 14—Nelson & McGraw, for the sum of $245,475. No. 15—J. B. Bertrand & Co., for the sum of $363,250. No. 16—King & Gough, for the sum of $206,000. No. 3—F. X. Berlinquet & Co., for the sum of $462,444. No. 4—Smith & Pitblado, for the sum of $438,318. Several of the contracts previously made were anulled and re-let, and all contracts were made to include clearing, grubbing, fencing, grading, masonry, bridging, and everything up to a formation level, except the iron bridge work for Trois, Pistoles, Metis, Restigouche, Miramichi, Nipissiguit and Folly rivers. The total amount of the 23 contracts awarded is $9,619,791, including payments made to the original contractors, but exclusive of the cost of the Eastern Railroad, $921,020.

Sufficient ties have been contracted for the sections approaching completion in Quebec and Nova Scotia, at prices varying from $15.88 per hundred to $32 per hundred.

Tenders for rails have been accepted as follows: Barrow Steel & Iron Co., England, 32,000 tons steel rails, namely 10,000 tons in 1871 at £12 per ton, delivered in Quebec, Halifax and St. John; and 22,000 tons of steel rails to be delivered in 1872 at £11 8s, delivered at such seaports as may be indicated. Ebbw Vale Co., England, 8,000 tons of street rails at £11 per ton, delivered at their port of shipment in England, in 1871. The contractors are bound to supply the proportionate quantities of fish-plates, and other necessary material at the same respective prices.

The following rolling stock has been contracted for, namely: 40 locomotive engines, 250 box freight cars and 150 platform cars, all of which are now in progress of construction. The contracts were made as follows: Dubs & Co., Glasgow, 15 locomotive engines at $11,000 each, in bond. Canadian Engine & Machinery Co., Kingston, 15 locomotive engines at $12,500 each. Wm. Montgomery, & Co., Halifax, 10 locomotive engines at $12,500 each. W. Hamilton & Son, Toronto, 150 box freight cars, at $719 per car. Gough & Hunter, St. John, 50 box freight cars at $735 per car. John F. Teed, Dorchester, 50 box freight cars at $735 per car. W. Clendinning, Montreal, 90 platform cars at $570 per car. Intercolonial Steel & Iron Company, Londonderry, 60 platform cars at $580 per car. From the contractors for the Eastern Extension Railroad the Commissioners have also purchased two locomotive engines for $17,000, and 25 platform cars at a total cost of $10,000, as well as two first-class passenger cars and one second-class car, at a total cost of $8 150, for use on that part of the Eastern Extension Railroad which is now open between Painsec Junction and Amherst.

It has been determined, on the report of the Chief Engineer, to construct the bridges over the rivers already enumerated, of iron, and all the rest of wood, provided such arrangements can be made with the contractors as will guarantee the progress of the work not being delayed and no large increase on the cost being incurred. In this the government has concurred, as, since it has been determined to lay steel rails, it has been thought advisable to construct the work of the most durable material possible.

The total engineering expenses amount to $613,704. The salary of the Secretary has been increased from $2,000 to $2,600 per annum Four district engineers now receive $3,000 per annum each, with $600 each per annum for horse hire and traveling expenses. The value of all work done by contractors on the 23 sections up to December, 1870, was $1,752,143. The approximate total force employed in the month of October, on 26 working days, 21,770 foremen and mechanics, 108,506 laborers, 9 360 boys, 5,098 quarrymen, 29,526 horses, and 323 oxen. This would give an average of about 5,490 men and boys working each day on this great national work.

### St. Paul & Chicago.

The completion of this road from St. Paul to Winona was reported in the Railroad Gazette of last week. The stations and distances along the line are, from St. Paul to

| | Miles. | Miles from St. Paul. |
|---|---|---|
| Newport | 8.1 | 8.1 |
| Langdon | 5.4 | 13 5 |
| Hastings | 6.2 | 19 7 |
| Etter | 8 5 | 28 2 |
| Red Wing | 12 5 | 40.7 |
| Frontenac | 10 65 | 51.3 |
| Lake City | 6.3 | 57.6 |
| Reed's Landing | 10.55 | 68.2 |
| Wabasshaw | 2.1 | 70.2 |
| Greenfield | 6.1 | 76.3 |
| Weaver | 7.5 | 83 8 |
| Minneiska | 3.03 | 86 9 |
| Minnesota City | 1 .3 | 97 9 |
| Winona | 5.8 | 103.0 |

### Chicago, Burlington & Quincy.

The company has been preparing for the construction of a second track between Downer's Grove and Hinsdale, 4⅛ miles and it was to be completed this week. There was before a double track between Riverside and Chicago, and grading for a second track between Riverside and Hinsdale will be commenced immediately.

### Missouri Pacific.

Last Saturday Collector Maguire, of St. Louis, advertised that he would sell, on the 29th inst., a large amount of personal property of the Missouri Pacific Railroad Company, but not including any rolling stock, to satisfy unpaid tax bills amounting to $24,000.

### Chicago, Pekin & Southwestern.

This road, from Marseilles, on the Rock Island road, southwest through Streator, Minonk and Washington, to Pekin, has been for some time graded. The iron for 20 miles of the road, from Pekin to Washington, has been bought and is now on the way from New York. It will be laid this year. Ralph Plumb & Co. are the contractors.

### Wisconsin Central.

The iron on this road is now laid to a point about 16 west of Menasha. A number of hindrances have arisen to prevent as rapid progress in the track-laying as was expected. It is announced that it will now go forward without interruption, and the grading be kept well in advance until Stevens' Point is reached. The contract for the foundations of the bridge over the Wisconsin River, at Stevens' Point, has been let to Burton Gale, of Portage. The line for 40 miles northwest of Stevens' Point has been located, and the profiles are being made ready for the letting. The company will be ready to receive bids probably as early as the 5th of September.

**Spirit Lake & Sioux Valley.**

A survey of this proposed railroad from Jackson, Minnesota, nearly due south by way of Spirit Lake, Iowa, to Storm Lake, on the Dubuque & Sioux City Railroad, about 75 miles, was to be commenced last week.

**Sheboygan & Fond du Lac.**

This company has located its lines from Fond du Lac westward by way of Ripon to Princeton, about 35¾ miles, and last week advertised for contracts to be handed in by the 25th inst. It is intended to complete this section of the road by winter, and to extend the line to the Mississippi as fast as practicable.

**Central of Iowa.**

This railroad, by the terms of contract, is to be extended from Mason City northward 22 miles to Northwood, five miles south of the Minnesota line, by the 10th of October next.

**Oshkosh & Mississippi.**

Officers of this company were in New York last week negotiating for iron for the section of the road between Oshkosh and Ripon, the grading of which is under contract.

**Gilman, Clinton & Springfield.**

Last Monday this railroad was completed to within fourteen miles of Springfield. Preparations are already made for operating it. It is reported that the Illinois Central Railroad will run passenger trains between Springfield and Chicago when it is completed.

**Peoria & Rock Island.**

Regular passenger trains were to commence running over this road this week.

**North & South, of Georgia.**

A contract for the construction of 20 miles of this railroad has been let to A. J. Lane & Co. and John T. Grant & Co. This road is to extend from Rome, Ga., nearly due south to Columbus, Ga., a distance of about 125 miles, through a hilly upland country close to the west border of the State. It is to be of 3 feet gauge. Large county subscriptions are expected for the completion of the line.

**Texas Pacific.**

It is reported that this company offers to establish its chief shops at Shreveport, La., on condition that the town give it 25 acres of land and loan it $100,000 in bonds for 20 years. It is also reported that it will commence the construction of the line from Shreveport eastward towards Vicksburg when the extension westward is commenced, and carry forward the former as rapidly as the latter. The Vicksburg & Shreveport line is now known as the North Louisiana & Texas Railroad, and 72 miles of it, from Vicksburg to Monroe, is is operation. There remains 118 miles to be built to complete it to Shreveport. The part in operation is of 5-feet 6-inch gauge.

**Great Western of Canada.**

It is reported that the Great Western authorities are negotiating for a lease, for a term of years, of the London & Port Stanley Railway. The consideration is understood to be a rental of $20,000 a year, Great Western workshops for London, and freight rates specially favorable to the business men of that city. This railroad extends from Port Stanley, on Lake Erie, nearly due north through St. Thomas to London, 25 miles. It is owned chiefly by the city of London and the County of Middlesex, in which London is situated.

**Detroit, Lansing & Lake Michigan.**

It is reported that this company has agreed to complete the construction of a branch line from Lansing nearly due north through DeWit, St. Johns, Ithaca and St. Louis to a point on the Flint & Pere Marquette Railroad in Isabella County.

**Arkansas Central.**

Work was to be commenced this week on a branch of this railroad (Helena to Little Rock) from Clarendon, where it will cross White River, southwest to the Arkansas at Pine Bluff, about 55 miles.

**Great Falls & Conway.**

An extension of this New Hampshire Railroad from Union Village northward to Ossippee, 17 miles, has been completed this season, and in a short time eleven miles more, to West Ossippee, will be ready for trains, greatly improving the route to the White Mountains.

**Worcester Railroad.**

This road is to be a line in Worcester County, Md., extending from Berlin, the eastern end of the Wicomico & Pocomoke Railroad (itself a branch of the Delaware Railroad) southward fourteen miles through Newark to Snow Hill. Iron has been ordered, and it is to be laid as far as Newark by the middle of September and to Snow Hill before November.

**Peoria & Springfield.**

It is reported that responsible parties have taken the contract to build the road in two years from August 1, 1870. One-half the line, south from Peoria, is to be built in one year from that date. The line from Peoria south to Pekin is to run on the east side of the Illinois, and thence south almost in a right line to Springfield.

**West Wisconsin.**

The River Falls (Wis.) *Recorder* says it is reported that the company have offered to build the road from River Falls to Warren, if the charter of the Prescott & Superior Railroad shall be delivered to the West Wisconsin. Warren is about ten miles east of Hudson on the line of the West Wisconsin Railway, and River Falls in ten miles south of Warren.

**Baltimore & St. Louis.**

Arrangements are being made for running Pullman sleeping cars through between these cities, over the Baltimore & Ohio, the Marietta & Cincinnati and the Ohio & Mississippi roads, which form a route only 928 miles long.

**Virginia & Maryland.**

This company, recently organized, proposes to construct a railroad from the Potomac River, between White's Ferry and Knoxville (a little below Harper's Ferry) nearly due south to Manassas Junction, 45 miles, crossing the Washington & Ohio Railroad at Leesburg or Hamilton, and passing fine marble quarries in Loudoun County.

**Evansville, Henderson & Nashville.**

The county of Christian, in Kentucky, has brought suit against the American Contract Company, which constructed this road, to set aside the lease of the road to H. B. Hanson, and a decision is expected soon. Notice, issued at the instance of this county, has been served on the directors for the purpose of restraining the board from issuing any more seven per cent. preferred stock to the American Contract Company, and notifying them that they will be held individually and personally liable therefor if they order or permit it.

**Houghton & Ontonagon.**

Iron for the first ten miles of this road has been bought of the Milwaukee Iron Company.

**Utica & Black River.**

An extension of this road from its present terminus at Lowville, N. Y., 59 miles north of Utica, northward about fifteen miles to Carthage, is nearly completed. Grading is completed for a further extension of about the same length from Carthage westward to Watertown.

**Marblehead & Swampscott.**

According to the Boston *Advertiser*, the citizens of Marblehead have voted—546 to 231—in favor of a railroad to Swampscott. The route is from Washington street, above the Common, in as direct a line as possible to Swampscott, striking the Eastern Railroad at a point near their depot, making the distance by rail 3½ miles, instead of 8, *via* Salem. The town is to loan its credit for $75,000, in behalf of the project, to John E. Gowen, of Lynn, who will build and equip it in eight months.

**Albany & Susquehanna.**

Preparations have been made for laying a third rail on this line between Albany and Nineveh, 120 miles, in order that cars of standard gauge may run through over it from Philadelphia to Montreal.

**Lanesboro & Nineveh.**

This railroad, extending from Lanesboro, on the line of the Erie Railway at the east side of the Great Bend of the Susquehanna nearly due north 18 miles to Nineveh, on the Albany & Susquehanna Railroad 23 miles west of Binghampton, has just been completed to connect the Delaware & Hudson Canal Company's coal-fields with the Albany road.

**Alexandria & Fredericksburg.**

Grading is progressing rapidly on this road, which is to connect the Richmond, Fredericksburg & Potomac Railroad with Washington. The road-bed is to be ready for the rails next month, and the track laid immediately thereafter.

**Milwaukee & Des Moines.**

The result of a conference between leading capitalists of Des Moines with representatives of the Milwaukee & St. Paul Railway Company is reported to be "an "arrangement which makes the assertion safe that the "Milwaukee & Des Moines road will be built within "a year." The route will probably be from Chickasaw Station, on the Iowa & Dakota Division of the Milwaukee & St. Paul, southwestward through Nashua, Butler Center and Ackley to Ames, and thence southward to Des Moines.

**Parkersburg, Ripley & Charleston.**

The Chief Engineer of this newly projected railroad, Mr. A. J. Vosburgh, will immediately commence surveys for the location of this railroad from Parkersburg, one of the Ohio River termini of the Baltimore & Ohio Railroad, southward through the counties of Wood, Jackson and Kanawha to Charleston, the new capital of West Virginia, through a country which needs a railroad badly.

**Alabama & Chattanooga.**

The Cincinnatti *Gazette* says: "Our Chattanooga correspondent succeeds in shedding some new light on the Alabama & Chattanooga Railroad question. As he sets it forth, the present position is this: The State of Alabama has seized the road, and will hold it until the interest on its bonds, amounting to upwards of $500,000, shall have been paid; while, on the other hand, employes of the road, to whom the road is indebted, have taken possession of parts of the locomotives and hidden them, thus preventing their running, and will not release them until their claims are satisfied. All now depends on Stanton. If he is able to raise money to pay the claims of the State the road can be again run, its receipts being then given to the employes."

**Southern Minnesota.**

The Rochester (Minn.) *Record* says: "Two mortgages for the sum of $3,600,000 each were recorded in this county July 31, 1871, given by the Southern Minnesota Railroad Comgany to S. B. Ruggles and A. P. Mann. Each mortgage was given to secure the payment of 3,600 bonds of $1,000 each. At the same time there was recorded a trust deed of 100,000 acres of land, given to the same parties, to secure the payment of $450,000 of debts incurred in the construction of said road."

**Kansas Central.**

On the 15th of August the city and county of Leavenworth voted almost unanimously in favor of giving this road their $250,000 stock in the Kansas Pacific. The gauge of the road is to be 3 feet, and it is announced that the first 50 miles, from Leavenworth a little north of west to Holton, in Jackson County, is to be in operation by April next.

**Gauge of Canadian Railroads.**

The *Canadian Monetary Times* gives the following account of the gauges of Canadian railroads:

"The existing railways of the Dominion are mostly on the 5-feet 6-inch gauge. We give the length and gauge of each of the lines of any consequence:

| 5 FEET 6 INCHES. | Miles. | 4 FEET 8½ INCHES. | Miles. |
|---|---|---|---|
| Grand Trunk | 1,377 | Great Western | 355 |
| Northern | 100 | St. Lawrence & Ottawa | 54 |
| London & Port Stanley | 25 | Massawippi Valley | 34 |
| Cobourg & Peterboro | 26 | Quebec & Gosford | 27 |
| European & North American | 108 | Montreal & Vermont Junct'n. | 26 |
| Western Extension | 88 | Stanst'd, Shefford & Chambly | 49 |
| New Brunswick & Canada | 138 | Province Line | 53 |
| Windsor & Annapolis | 85 | Wellington, Grey & Bruce | 25 |
| Brockville & Ottawa | 9 | | 593 |
| Welland | 25 | 3 FEET 6 INCHES. | |
| Midland | 79 | Erie & Niagara | 81 |
| Nova Scotia | 145 | Toronto, Grey & Bruce | 73 |
| Canada Central | 25 | Toronto & Nipissing | 31 |
| | 2,545 | | 104 |

"In the western part of Ontario two important lines, the Canadian Air Line and the Canadian Southern are being built on the 4-feet 8½-inch gauge; the Wellington, Grey & Bruce is being extended on the same gauge; the Intercolonial, Toronto & Muskoka, North Grey, Canada Central, and probably other lines are being constructed on the Canadian standard—5 feet 6 inches. The London & Port Stanley is likely to be reduced to 4 feet 8½ inches, and it is said the Whitby & Port Perry will be of this width."

**Baltimore & Potomac.**

This company has awarded the contract for arching the tunnel by which the road runs under the city of Baltimore from Cathedral to Arch street, to Mr. Henry E. Loane, of that city. The length of the tunnel is nearly a mile and a half, all of which is first excavated, to be filled in when the arch is erected, except about one hundred feet. This is said to be one of the largest contracts for brick-work ever awarded in Baltimore; involving as it will the use of more than fifteen millions of brick.

**Port Huron & Lake Michigan.**

It is reported that sufficient iron to complete this railroad from its present terminus at Lapeer to Flint has been received at Port Huron, and that there is no doubt of the completion of that section of the road before the 1st of October. Also that ample funds to pay for the iron between Flint and Owosso have been procured, and that section of the road will be immediately put under contract. The earnings of the road on the section completed—from Port Huron to Lapeer—from passengers and freight for the month of July, reached $17,871.42.

**Union Pacific.**

The following is the statement ot the Land Department of the Union Pacific Railroad Company:

| | |
|---|---|
| **SALES.** | |
| June and July, 1871— | |
| Acres, 50,047 61-100 for | $197,805 96 |
| Average per acre | 3 88 |
| Land-grant bonds canceled | 49,000 00 |
| Total sales to July 31, 1871— | |
| Acres, 418,403 62-100, for | 1,819,819 16 |
| Average per acre | 4 35 |
| Land belonging to the company remaining unsold, acres, 11,661,596 38-100. | |
| **LAND-GRANT BONDS.** | |
| Total amount issued | $10,400,000 00 |
| Less bonds canceled by Land Department | 24,000 00 |
| Bought by trustees | 150,000 00 |
| | 974,000 00 |
| Leaving bonds outstanding | $9,426,000 00 |
| **LAND NOTES ON HAND.** | |
| July 31... Principal (interest not included) | $33,429 86 |

**Cayuga Lake Shore.**

The contract for the construction of this New York railroad has been let to Colton Smith, of Massachusetts.

**Memphis & Little Rock.**

A company has been organized to construct a branch railroad from Lonoke, a station on this railroad 24 miles east of Little Rock, northwest 15 miles to a junction with the Cairo & Fulton road at Jackson Springs.

**Jacksonville, Pensacola & Mobile.**

The firm to which the contract for completing the extension of this railroad from its present terminus at Quincy to Pensacola and Mobile, about 250 miles, has been let, consists of C. C. & E. G. Smith, well known contractors and bridge-builders of La Crosse, Wis.; J. H. Gardner, late Superintendent of the Southern Minnesota Railroad, and C. L. Chase, of La Crosse. Mr. Gardner (who has made a reputation in the Northwest as an able and trustworthy manager) will, we understand, have general charge of the construction. Engines, pile-drivers and other plant have been forwarded from La Crosse, and there are already a thousand men working for the contractors. Most of the grading from Quincy to the Chattahochee River, was done some time ago. There will be three large bridges on the line. It is intended to complete the work within eighteen months. The road is now in operation from Jacksonville, Fla., about twenty miles from the mouth of the St. John River, nearly due west 190 miles to Quincy, twenty-four miles west of Tallahassee, with a branch from Tallahassee south to the Gulf at St. Marks, twenty-one miles, and a short branch to Monticello, four miles long. Completed it will form a line nearly 450 miles long entirely across the northern part of Florida, from twelve to thirty miles from its northern border, and from Tallahassee westward will be usually as much as twenty-five miles from the gulf coast. The extension for much of the way will be over a fine rolling country productive in cotton—being an exception to most of the coast country, which is usually flat and covered with pine woods. It will carry produce as far as possible to Jacksonville. Intersecting railroads enable it to forward to Fernandina and Savannah.

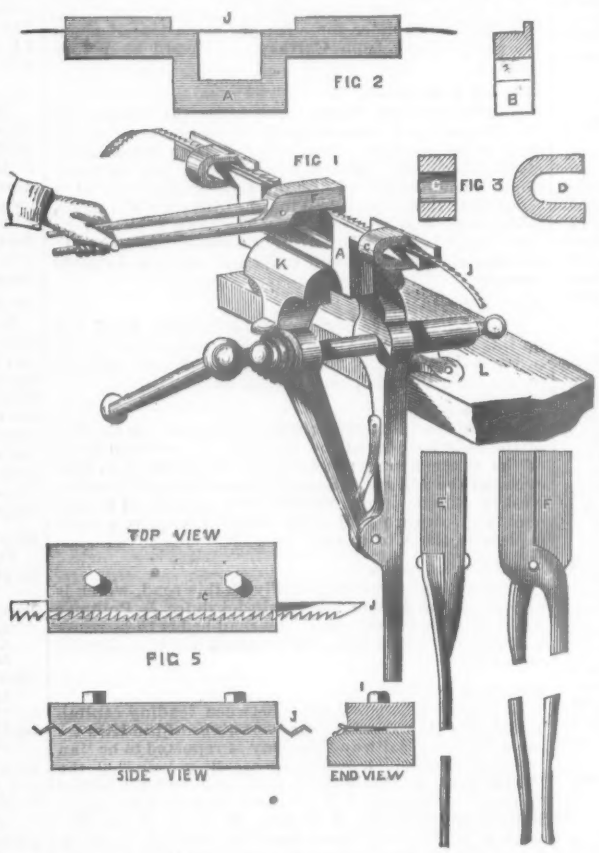
## MECHANICS AND ENGINEERING.

### Protecting Telegraph Lines from Lightning.

Much trouble has always been experienced from lightning on a section of telegraph line between Riverside and the Stock Yards, on the Chicago, Burlington & Quincy Railroad. Poles are frequently shivered to splinters, and much other damage done during the heavy storms which occur there during the summer. About a year and a half ago, Mr. F. H. Tubbs tried the experiment of attaching a lighting conductor to each pole of this section, consisting simply of a No. 7 iron wire, one end of which was secured underneath the iron ring at the top of the pole, and the other buried in the ground, the wire making one complete turn around the pole two or three feet below the top. This simple and inexpensive precaution has thus far prevented any damage whatever from lightning on the section protected, although this is the second summer it has been in use, while formerly not a summer passed without several poles being destroyed in this manner. —*The Telegrapher.*

### Mending and Re-Setting Band-Saws.

I usually mend and set band-saws in the following manner: Lay the saw flat on the saw-holder, with the end flush with inside of arms, twisting the saw so that the teeth lie in opposite directions, put on the cramps, and with a smooth file file the ends about three or four teeth up, tapering off to nothing at the ends; keep the joint clean, take off the cramps, take twist out of saw, lay the ends one upon the other in the center between the arms, bend the fine ends inwards a little, and keep the teeth fair—take a piece of thin solder, which you can get from the saw-maker, a little less than the lap, lay a little powdered borax on the solder and put between the joint; heat your tongs to a light cherry color, clean the tongs with a file, then grip the saw by the joint till you can see the solder is melted; take away the tongs, and drop a few drops of water on the joint till cool; if a good joint, file it to its proper thickness with a smooth file. The following sketch will explain everything that "An Old Subscriber" wants: Fig. 1: *A*, saw-holder; *C C*, cramps to hold the saw on the holder; *E*, tongs; *J*, saw; *K*, vice; *L*, vice board. Fig. 2: *A* and *B*, saw holder. Fig. 3: *C* and *D*, cramps. Fig. 4: *E* and *F*, tongs. Fig. 5: *G H I*, saw set, which requires but a hammer and punch; *J J*, saw in position for setting.—*Correspondence English Mechaanic.*




### The Mont Cenis Tunnel.

Numerous disparaging rumors have of late been afloat respecting the Mont Cenis Tunnel. It was said that the arch had fallen in for a length of 170 feet; it was affirmed that the heat in the tunnel was insupportable, and that engine drivers had been suffocated from the smoke of the locomotives. There has never been one stone displaced from the finished arch of the Apine tunnel, the work of which is so solidly constructed that it is well nigh as durable as the rocks themselves. The only circumstance which served as a formation for these absurd reports was the falling in of eighteen or twenty feet of work, which happened in the last days of June at the Bardonneche end, in consequence of the falling of some scaffolding broken by the explosion of a blasting charge. In this accident two workmen were killed and five were injured.

As yet no experiments have been made with steam working through the tunnel, but all evidence goes to show that locomotives will fulfill all the requirements, and will do the duty well. Good ventilation is well established, and if it should be found insufficient, the compressors so long employed in the work of excavation, and which have been now idle for so long a time, can be used at both ends. The heat is not excessive; before the completion of the work it did not exceed 82 or 84 degrees, and since the piercing was completed the temperature is so moderate that the workmen have no longer any necessity for working stripped to the waist, the through draught of air creating a decided ventiliation in the tunnel.—*Engineering, Aug.* 4.

### The Baldwin Narrow-Gauge Locomotives at Work.

The narrow-gauge locomotives, built by the Baldwin Locomotive Works for the Denver & Rio Grande Railway, have been set up and tried on the line of that road near Denver, and are now in operation in the construction of the road. About three and a half miles of narrow-gauge track (three feet) had been laid out of Denver at last accounts, and upon this the small engines have been thoroughly tested. Immediately upon leaving Denver the track is laid to a temporary grade of 140 feet to the mile. Up this grade the freight locomotive pulled 20 of their four-wheeled flat cars loaded with railroad iron. The engine handled this train without difficulty, stopping and starting readily with it on the grade. This engine has three pairs of drivers 36 inches in diameter, a "pony truck" in front, and weighs, in running order, 34,000 pounds.

The passenger engine "Montezuma" (with two pairs of drivers and "pony truck," weight, 25,000 pounds) drew a train of six passenger cars at a speed of thirty miles an hour, making the time with ease. The engines ride well and steam freely. We are permitted to print the following letter from the General Superintendent and General Manager, Mr. W. H. Greenwood, to M. Baird & Co., who has charge of the construction and operation of the line. It is dated at Denver, August 12:

"This is to certify that your engineer has delivered "to the Denver & Rio Grand Railway the three engines "constructed for them by your company. The engines, "so far as they have been used, have proved a perfect "success, and I fully believe they will perform all the "work they were guaranteed to perform. I have "always had full faith in the success of the narrow-"gauge (three feet in this case), and the working of the "engines, as well as of the other rolling stock, which "we now have on hand, fully demonstrate that we were "justified in reducing the gauge on our road."

### Boston & Albany Shops.

The Boston & Albany Railroad will complete, next month, a shop at Allston 315 feet long and 71 feet wide, with walls 18 feet high. A section of it, 250 feet long, will be used for building and repairing freight cars, and the other 65 feet for the machines. The other sections, built last year, comprise about 200 feet for a wood machine shop, 200 for making and repairing passenger coaches, 200 for a paint shop, 75 for blacksmith, with a total length of shops of 815 feet.

### Union Passenger Depot at Denver.

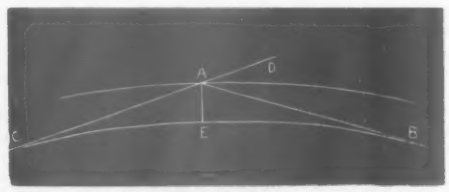
The Denver *News* gives the dimensions of the new union passenger depot about to be built for the Denver Pacific and Kansas Pacific companies:

"It is to be 30x80 feet, two stories, respectively 14 feet and 13 feet high. It will be built of brick, and will present a very neat and architectural appearance. The first floor will be divided into a ladies' room, 14½x27, with a retiring room, 8½x27; a ticket and telegraph office, respectively 8½x16½ and 8½x9 ft. 8 in.; a gentlemen's room, 19 ft. 9 in. x 27 feet. The ticket and telegraph offices are between the waiting rooms, and open into each; while the baggage room contains a vault for the storing away of papers. The second stories will be divided into offices for the use of the Kansas Pacific and Denver Pacific companies, who are jointly interested in the building. The cost will be between $10,000 and $12,000; and it is hoped to have it ready for occupancy by the first of December. It is to be furnished in the most approved manner."

### Railroad Curves.

It is sometimes desired to obtain the degree of curvature where the track is already laid. Mr. S. W. Miffin, of Columbia, Pa., has, in the preparation of a work on railroad curves, hit upon a curious solution of the problem. The demonstration is tedious but the conclusion may be relied on, with this caution, that railroad tracks do not long maintain their shape with mathematical accuracy, and therefore a mean of several measurements may be necessary to insure a correct result.

If from a point, *A*, in the edge of the outer rail of a railroad track, the lines, *A B*, *A C*, be drawn tangent to




the inner rail, then the square of the number of degrees in the exterior angle, *D A B*, multiplied by the width of the track, *A E*, (4 2-3-feet) will be just equal to one hundred times the curvature.

### Rock Island Bridge.

The bed rock of the Mississippi for the location of the last pier of the new bridge at Rock Island has at last been reached, about twelve feet below the bed of the water and the construction of the foundation commenced. The contractors for the superstructure have begun operations, and will set one span about every six weeks. The bridge is to be opened next spring.

### Canal Boat Propulsion.

At a meeting of the commissioners appointed to examine plans for propelling boats on the New York canals in Syracuse on the 14th inst., Mr. Geddes said that to remove misapprehension, and to prevent inventors from wasting their energies in fighting imaginary difficulties, he would offer the following:

*Resolved*, That the experiments heretofore made in navigating the canals by freight boats propelled by steam have not been failures by reason of injury done the banks of the canals by the swell caused either by the motion of the boat or the wheels through the water; and that in the judgment of this Commission there is no practical difficulty in navigating the canals by boats carrying two hundred tons of cargo, at the rate of three miles per hour, that arises from "injury to the canals or their structures." The main difficulty to be overcome is to establish the economy of steam or other motor as compared with animal power.

This resolution was adopted unanimously.

### Handling Coal.

Messrs. Strong & Rogers, of Worcester, have just completed, on the new wharf of the Norwich & Worcester Railroad Company at Norwich, an elevator for the rapid loading and unloading of coal. The building is 150 feet long, 31 feet wide and 30 feet high. The floor is built ten feet above the level of the ground. Above this the building is divided into twenty compartments, called "pockets," in the floor of nineteen of which is a valve operated by a lever. In the twentieth is a six-horse-power engine and boiler, with which and a heavy derrick on the roof the coal from a vessel's hold is rapidly hoisted into either of the compartments, whence it may be discharged by means of the valve into cars below—two tracks running beneath the building. Each compartment is capable of holding one hundred tons of coal, and as the contents of the entire number may be simultaneously discharged, it is evident that the gain in points of time and labor is immense. The elevator, which is a heavy, substantial structure, was built by Johnson & Searles, of Providence, at a cost of ten thousand dollars—over two hundred thousand feet of lumber and plank being used in its construction. The engine was constructed by Richard Colburn, Master Mechanic of the Norwich & Worcester Railroad Company's shop.—*Boston American.*

### The Brooks Insulators.

Over three hundred telegraph operators, including superintendents, chief operators and experts, connected with the telegraph lines in Pennsylvania, where the Brooks insulators were first introduced, have signed and presented him a certificate stating their belief, based on their own experience, that as much can be done in wet weather on one wire insulated with the Brooks insulator, as on four insulated with the common glass, and at less than one-fourth the expense.—*Railroad and Mining Register.*

## TRAFFIC AND EARNINGS.

—A Philadelphia paper of the 15th chronicles the fact that a few days ago a coal-shipping firm cleared a canal barge laden with anthracite coal for Montreal, by the inland navigation route. This passes up the Delaware River, through the Delaware & Raritan Canal, through Raritan River and Bay, up New York Bay and Hudson River, through the Champlain Canal and Lake Champlain, and so on through the Richelieu or Sorel River to the St. Lawrence. It is claimed that this route of navigation competes successfully with the railroads.

—The traffic receipts of the Great Western of Canada for the week ending July 28 amounted to £18,418, against £13,338 in the corresponding week of last year, showing an increase of £5,080, or 38 per cent.

—The traffic receipts of the Grand Trunk of Canada for the week ending July 29 amounted to £32,000, against £27,900 in the corresponding week of last year, showing an increase of of £4,100, or nearly 15 per cent.

—In Leavenworth, on the 18th inst., General Easton, Chief Quartermaster of the department, awarded W. C. Graham, of St. Louis, a contract for transporting government supplies to Fort Sill, Indian Territory, and Forts Richardson and Griffin, Texas, for one year, amounting to nearly $500,000.

—Eighty car loads, aggregating 1,600,000 pounds of fresh teas were shipped eastward from San Francisco last week, and another steamer with a full cargo, to be forwarded in the same way, was expected this week.

—There were shipped east ever the Pacific road during July 452 tons of bullion and 2,660 tons of ore, of which ore 250 cars were destined for Swansea, Wales, and the balance to various reducing works throughout the country.

—The receipts of the Raleigh & Gaston Railroad (97 miles long) for the year ending May 1, 1871, were $348,422, and the operating expenses, $204,177—leaving a balance of $144,145.

—The Boston *Advertiser* says that the local passenger rates upon the Boston & Albany Railroad, on and after October 1st, are to be reduced to three cents a mile for all distances of twenty miles and under, and to two and eighty-three one-hundredths cents a mile for all distances over twenty miles where the present rates are above these figures.